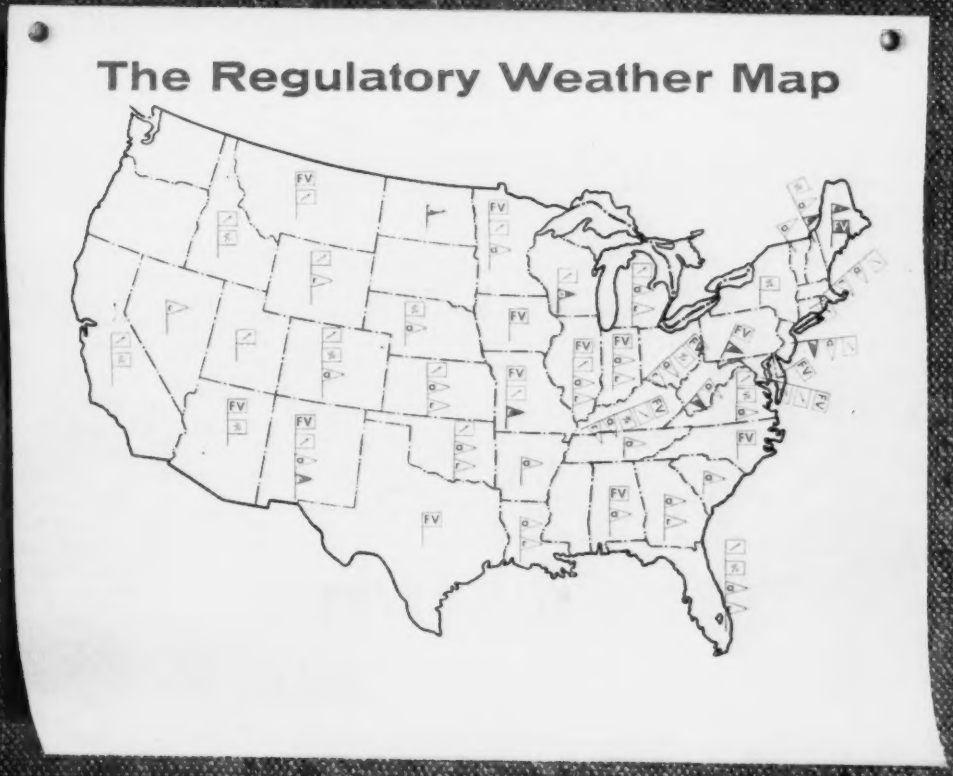
The Electrical Industry's Weekly Magazine

February 9, 1959

Electrical World

Price 50 Cents

A McGraw-Hill Publication



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NATIONAL ELECTRICAL WEEK
FEB. 8-14, 1959

ELECTRICITY BUILDS JOBS ...p

ANN ARBOR MICH
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UNIVERSITY MICROFILMS IN
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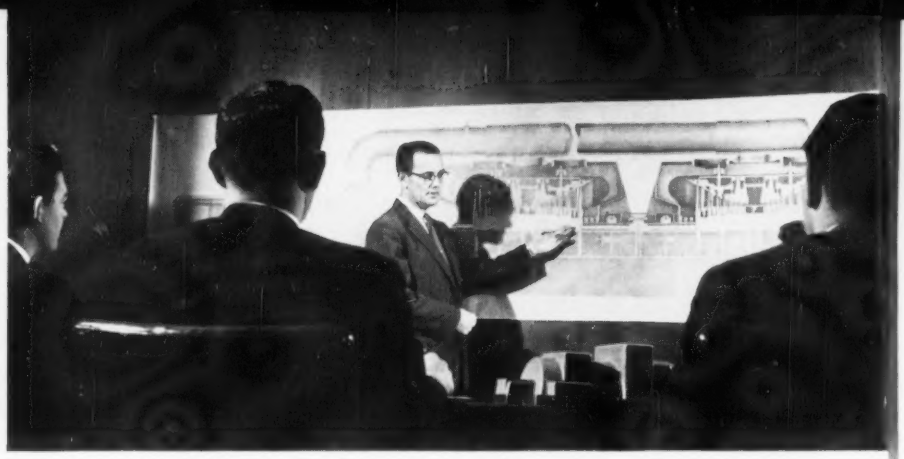
ELECTRICAL WORLD • Vol. 151 No. 6

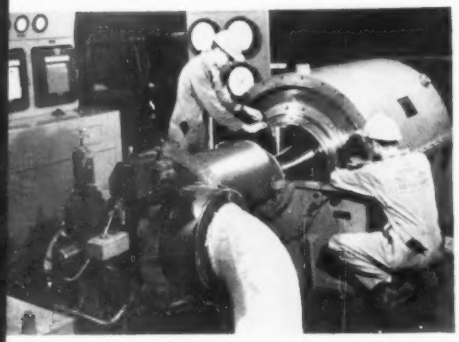
How General Electric is developing better steam turbine-generator service



Engineering seminars held at factory by men like J. E. Downs, Mgr.—Turbine Engineering, inform field service representatives of latest advances. Average professional experience of each local G-E service representative is 17 years.

Completely integrated service—from initial order of a turbine-generator throughout its operating life—is an *added value* available to purchasers of General Electric steam turbine-generator units. Experienced field representatives and local specialists, backed by a headquarters Product Service organization form an integrated service effort designed to help electric utilities achieve more economical generation of electricity.

Here are some ways that G-E service helps maintain the product superiority built into each unit:



Laboratory testing of full-size parts like new thrust bearing (above), other continuing studies, confirm component design improvements.

INSTALLATION SERVICE STUDY TEAM helps simplify field erection by continually studying methods for reducing installation time and cost. It also seeks easier inspection procedures by suggesting appropriate improvements in equipment design.

PERFORMANCE INTERPRETATION helps owners evaluate abnormal sectional pressures and efficiencies, loss of capacity, and other operating irregularities. General Electric initiates tests to prove new designs, and aids owners in conducting their own performance tests on duplicate machines.

ENGINEERING CONSULTATION is continuously available from factory components. Here electrical and mechanical engineers specialize in providing prompt supporting attention to problems that may arise during the life of your unit.

MATERIALS AND PROCESSES LABORATORY ASSISTANCE is offered for any unusual service requirement. Nearly 300 physicists, chemists, specialists and technicians are available for field studies, consultation, and advanced nondestructive testing.

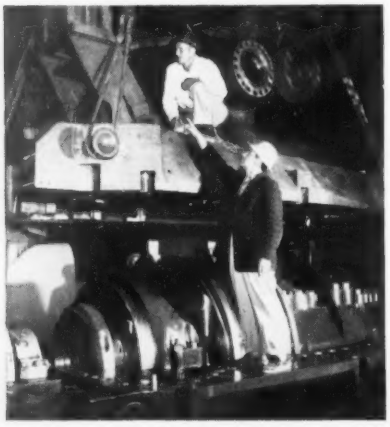
MAINTENANCE TASK FORCE establishes procedures to speed repairs and minimize outages by: assuring efficient repair routines, carefully analyzing shop operations to eliminate uncertainties, and coordinating our action with owner's requirements.

MATERIAL PROCUREMENT ADVANTAGES help reduce downtime. Large volume production, a backlog of currently approved materials such as composite forgings, tubing, and bar stock, and an efficient purchasing organization constitute power aids in meeting emergency requirements.

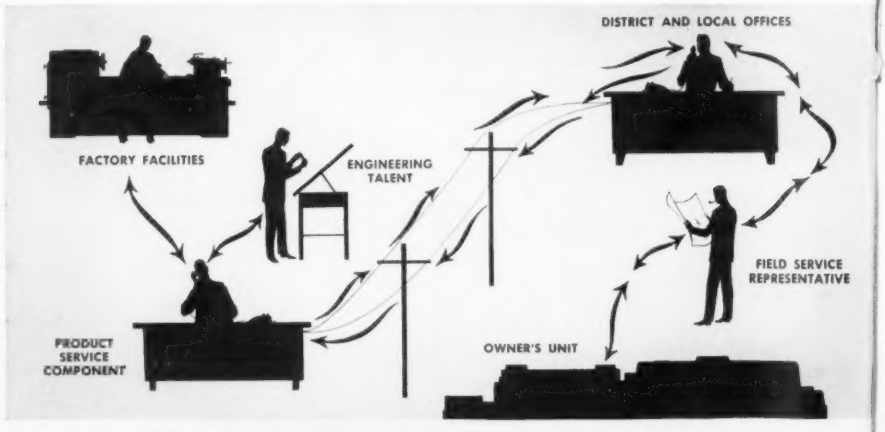
General Electric's integrated service program of KEEPING POWER MAKERS ON THE LINE provides a major *added value* that helps increase system efficiency and reliability, and reduce operating expenditures. For more information on this Program, contact your nearest G-E Apparatus Sales Office or write for Bulletin GED-3666 "Keeping Powermakers on the Line." General Electric Co., Section 301-392, Schenectady 5, N. Y.

MORE POWER TO AMERICA

GENERAL ELECTRIC



Engineering evaluation at plant site by G-E specialists improves installation time and costs.



Two-way flow of service information through Product Service component permits close liaison between factory personnel and field representatives on specific service problems.

Electrical World

Vol. 151, No. 6 FEBRUARY 9, 1959

Published for 85 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

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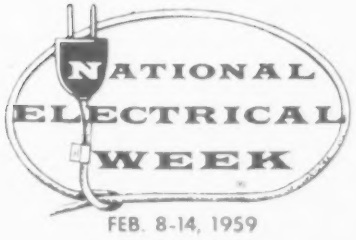

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Industry Set for National Electrical Week

Utilities, manufacturers plan host of special events in nationwide observance. Edison to be commemorated.....p 44

INDUSTRIAL

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Plea made for closer cooperation between consultant, industrial engineer, and utility representative.....p 54

MANAGEMENT

Wisconsin P&L Greets the Shareholder

During series of 16 meetings with 5,000 Wisconsin stockholders, WP&L management teaches and learns.....p 48

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Orbie M. Campbell, Georgia Power Co

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One construction, one basic cable design finds many uses. Open coal conveyor structure shown under construction above carries Okolite-Okoprene power and control cables from Metropolitan Edison Company's new Portland Generating Station to coal storage yard. Three types of the same cable meet in the tunnel (right) beneath the switching station: Okolite-Okoprene with CM-OT finish; Okolite-Okoprene with aluminum Loxarmor; Okolite-Okoprene with straight Okoprene sheath.

Another leading utility picks
Okolite-Okoprene for maximum margin of safety

Utmost reliability, proved by long-term service records, is the reason why Okolite-Okoprene was selected for the brand new Portland, Pa., Generating Station of the Metropolitan Edison Company—engineered by Gilbert Associates, Inc. Various Okolite-Okoprene cables have been installed for 600-volt power and control service with protective coverings designed for specific installation conditions. For example:

- **To avoid expense of conduit...permit quick addition of new circuits**...Okolite-Okoprene power cable with flexible aluminum Loxarmor, in trays, carries power to motors, pumps, coal conveyors, fans and practically all other operating equipment.

- **For maximum protection against soil corrosion, mechanical damage and insect attack**...Okolite-Okoprene control cable with Type CM-OT (corrugated bronze tape) finish is used for direct burial underground circuits to the switching station in the yard. Finish combines remarkable compressive strength with light weight and easy handling.

- **For great weathering strength and resistance to abrasion**... Okolite-Okoprene control cable with an overall Okoprene sheath is used for most other control circuits within station ...and installed in outdoor trays leading to coal storage yard.

Power stations from coast to coast rely on Okolite-Okoprene for vital power and control circuits—a testimonial to its dependability . . . its long life and dielectric strength . . . its resistance to corona cutting, moisture, heat, chemicals and mechanical damage. For further information on this premium quality cable, made by Okonite's exclusive strip-insulating process . . . and its adaptability to your important circuits, write for Bulletin EW-1085, The Okonite Company, Passaic, New Jersey.

***where there's electrical power... there's* OKONITE CABLE**

6358

It Pays to Read the Ads

A few weeks ago an electrical manufacturer was literally swamped with requests for information on a product advertised in Electrical World. This product and its application to electrical systems had been advertised successfully before. But this time something very timely was emphasized. The key was—saving money. For today everyone in the industry is looking harder than ever for ways to reduce capital investment. This is the number one problem.

In this issue of Electrical World, sixty-five suppliers of equipment and services are presenting important and useful information for you. This advertising, like that referred to above, provides valuable data on new and better products that can be applied to the improvement and economic expansion of electric systems.

That is what businesspaper advertising is designed to do for our readers. It's the editorial pages of Electrical World that tell you how to do the job. But it is the advertising pages that tell you what equipment to use. Advertising works for you so "it pays to read the ads".

Fischer Black

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Vol. 151, No. 6, Feb. 9, 1959

Published weekly by McGraw-Hill Publishing Co., Inc., James H. McGraw (1860-1948), Founder. **Executive, Editorial, Circulation and Advertising Offices:** McGraw-Hill Building, 330 West 42nd Street, New York 36, N. Y. Printed at 99-129 North Broadway, Albany 1, N. Y. See panel at right for information regarding subscriptions or change of address.

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Subscriptions are solicited from executive, supervisory, and engineering personnel in electric utilities, manufacturing companies, and related fields; and from consulting engineers and electrical engineers in industry. Position and company connection must be indicated on subscription orders. Send to address shown in box at right.

United States and Canada subscription rate for individuals in the field of the publication $6.00 per year; single copies 50 cents. Other Western Hemisphere and the Philippines $20.00 payable in advance and other countries $30.00 payable in advance.

Second-class postage paid at Albany, N. Y. Title registered in U. S. Patent Office.

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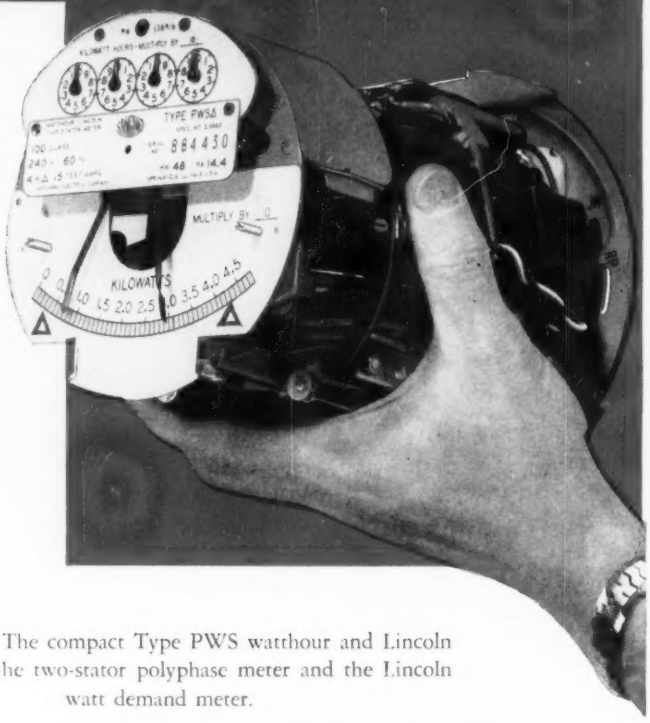
Postmaster . . . Please send form 3579 to Electrical World, 330 W. 42nd St., New York 36, N. Y.

DEVELOPED TO MEET YOUR NEEDS:

NEW SANGAMO DEMAND METERS of the type that YOU prefer!



THERMAL DEMAND The compact Type PWS watthour and Lincoln demand meter combines the new features of the two-stator polyphase meter and the Lincoln watt demand meter.

It's easy to read—easy to adjust. Simplified design makes components readily accessible.

Where future load growth is anticipated, capacity of the demand element can be doubled by changing two link connections and changing the demand scales (24/48 kw or 48/96 kw).

MECHANICAL DEMAND

Sangamo's new Type D mechanical demand register, when installed on any of the Sangamo Type P2 extended range watthour meters, accurately measures kw demand on all polyphase loads.

Universal and standard Type D registers were designed to give greater disk visibility, better service accuracy, time interval indication, and simple disengagement of timing motor for register checking.

ACKNOWLEDGED LEADERSHIP IN DEMAND MEASUREMENT

SANGAMO ELECTRIC COMPANY

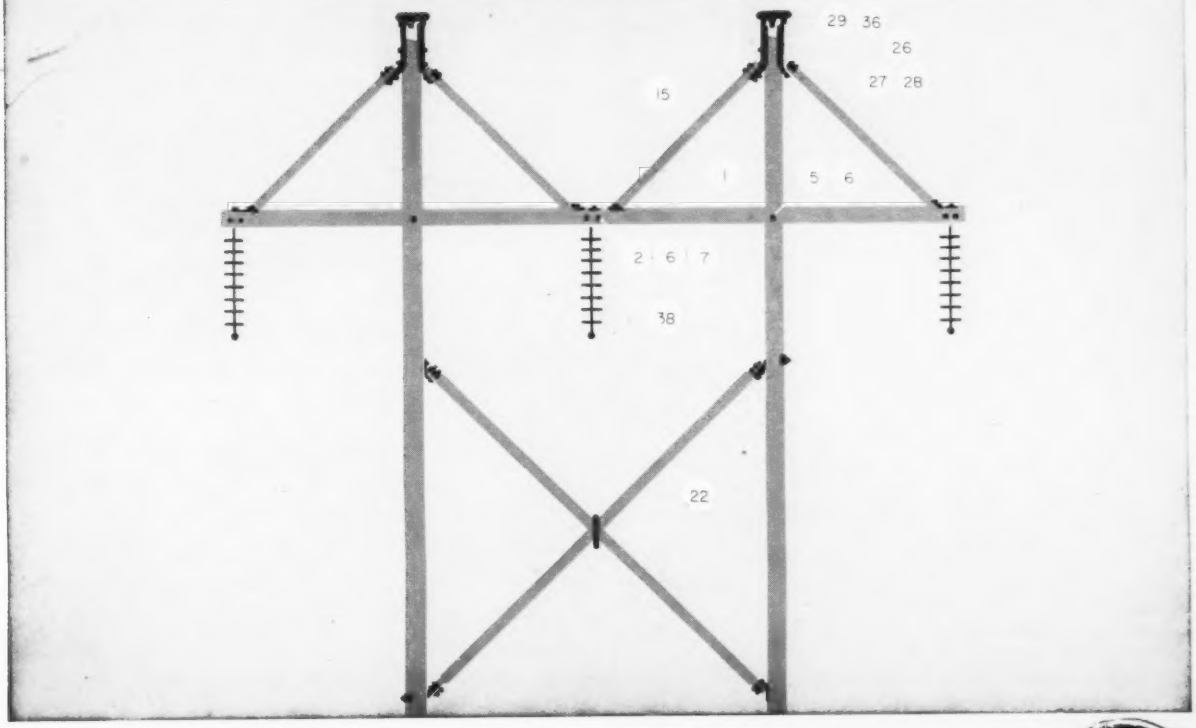
SPRINGFIELD, ILLINOIS

JM59-2

TANGENT W/BRACES NO. 702

H-FRAME STRUCTURE, DOUBLE PLANK CROSSARMS WITH METAL SPACERS, POLE TOP STATIC WIRE SUPPORTS, AND WOOD CROSS BRACES DESIGNED FOR 69 TO 154 KV CONSTRUCTION

DRG. REF. #	QUANTITY	DESCRIPTION	DRG. REF. #	QUANTITY	DESCRIPTION
792	2	Pole	15	4	Vee brace 3⅜" x 4⅜" cross section
1	2	Crossarm	22	1 set	Cross brace w/fittings, clamp, ⅞" pole bolts and curved washers
2	3	Steel spacer fitting w/mounting bolts	26	2	Static wire support
5	2	Stud bolt ⅞" w/washer nuts	27	4	Machine bolt ¾"
6	8	MF locknut ⅞"	28	4	MF locknut ¾"
7	1	Bent stud bolt ⅞" x 8" w/2 sq. nuts	29	2	Clevis
			36	2	Suspension clamp for static wire
7	2	Bent bolt ⅞" x 5½" w/sq. nut	38	As required	Suspension insulators and fittings



SIMPLIFY YOUR POLE LINE PROJECTS . . .

ORDER via Graybar

The combination of top quality materials and specialized Graybar service can make a substantial contribution to simplifying your pole line projects. For example, take the structure illustrated here.

These complete cross-arm units are fabricated and fitted with hardware according to *your* specifications. Every pre-bored member fits perfectly. You reduce time consumed and cost of field assembly. You can plan on a far more smoother, efficient operation and completing the job on schedule.

Need assistance in solving tough or unusual problems? In addition to our regular service, Graybar Outside Construction specialists and field representatives are always ready to share with you their specialized knowledge.

For assistance, advice, complete quotations and the quality materials that assure uninterrupted service to your customers, make your next transmission or pole line order read "via Graybar".

761

GRAYBAR ELECTRIC COMPANY, INC.
420 Lexington Avenue, New York 17, N. Y.

Call Graybar first for...

Everything Electrical GraybaR ELECTRIC COMPANY

IN OVER 130 PRINCIPAL CITIES

PENNSYLVANIA TRANSFORMER introduces .....

1st ■ ■ ■ LTC transformer to permit safe inspection and maintenance of LTC switch contacts and complete drive mechanism while transformer remains energized and supplies uninterrupted three-phase power to its load.

1st ■ ■ ■ three-phase LTC transformer to provide *SINGLE PHASE* regulation controlled individually from separate independent control circuits.

In announcing the new Phase-Isolated LTC Transformer, the sales and design engineers believe they are offering the ultimate in three-phase transformers. For the first time, here is a transformer that offers you *ALL* of the advantages and flexibilities of single-phase regulation. The cost is only slightly higher than that of a conventional three-phase LTC transformer; however, this extra cost is more than erased by the economies derived in the following two ways:

(1) Purchasing and handling a single piece of equipment.

(2) Installing and placing into service one Phase-Isolated LTC three-phase transformer rather than three separate regulators, bypass switches and a transformer or a transformer bank.

THREE INDEPENDENT CONTROL CIRCUITS

Each phase of Pennsylvania's three-phase LTC transformer has an independent control circuit and LTC mechanism. This enables it to regulate the outgoing voltage of each phase in accordance with the individual load demands of each phase. The separate control circuit for each phase allows the accurate selection of "R" and "X" compensation settings for each phase. Similarly, each phase has its own independent voltage regulating relay, voltage level adjustment, band width adjustment, operation selector switch, operation counter, integrating time delay assembly, and potential test terminals.

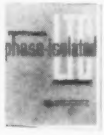
COMPLETELY SELF-CONTAINED

All Pennsylvania Phase-Isolated LTC Transformers are completely self-contained. Each phase has a separate internally mounted current transformer for its independent line drop compensator and a separate internally mounted potential supply for its independent voltage regulating relay and LTC mechanism drive motor.

BYPASS SWITCH

Each phase of Pennsylvania's Phase-Isolated LTC Transformers has a manually operated, integrally mounted, oil-immersed combination LTC bypass, disconnecting, and grounding switch that permits safe inspection and maintenance of LTC switch contacts and complete drive mechanism while the transformer remains energized supplying uninterrupted three-phase power. The bypass switch for each phase is key interlocked to prevent operation except when the LTC mechanism for that phase is in its neutral position. Terminals are provided for the convenient attachment of visible grounds to both ends of the series winding and both ends of the preventive auto winding when the LTC compartment is open.

For further information write on your company letterhead for free copy of descriptive booklet No. 591. Address Sales Dept. Pennsylvania Transformer Division, McGraw-Edison Company, Canonsburg, Pa.



Pennsylvania Phase-Isolated Three-Phase Transformers are available in the following kva and voltage ratings:

BIL	LOW VOLTAGE	KVA
75 Kv	4160Y/2400 or 4360Y/2520 volts	1000 Kva thru 2500/3125 Kva incl.
95 Kv	8320Y/4800 or 8720Y/5040 volts	1000 Kva thru 5000/6250 Kva incl.
110 Kv	12470Y/7200 or 13090Y/7560 or 13200Y/7620 or 13800Y/7900 volts	1000 Kva thru 7500/9375 Kva incl.

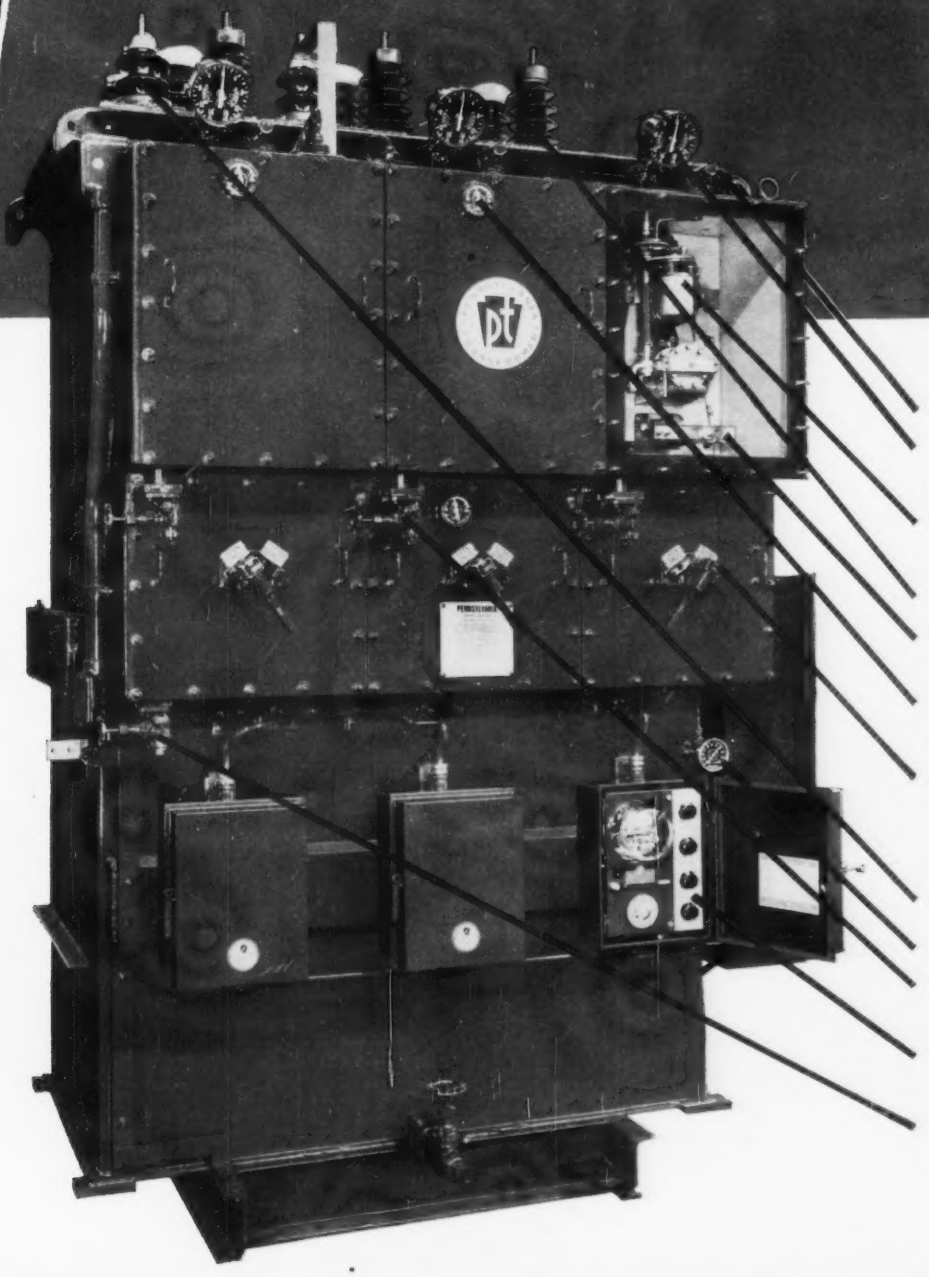
PENNSYLVANIA TRANSFORMER DIVISION
McGRAW-EDISON COMPANY
CANONSBURG, PA. *Greater Pittsburgh District*

McGRAW EDISON

PENNSYLVANIA

the NEW Phase-Isolated LTC TRANSFORMER

(Patent Applied For)



- Key interlock.
- Position indicator with adjustable limit switches.
- Individual LTC mechanism and drive motor.
- High voltage bushings.
- Provisions for conveniently applying visible grounds.
- Magnetic type liquid level indicator.
- Key interlocked, manually operated, combination LTC bypass, disconnecting and grounding switch.
- Low voltage bushings.
- Pressure vacuum gauge.
- Individual LTC compartment drain valves.
- Weatherproof control cabinet.
- Bypass switch compartment drain valve.

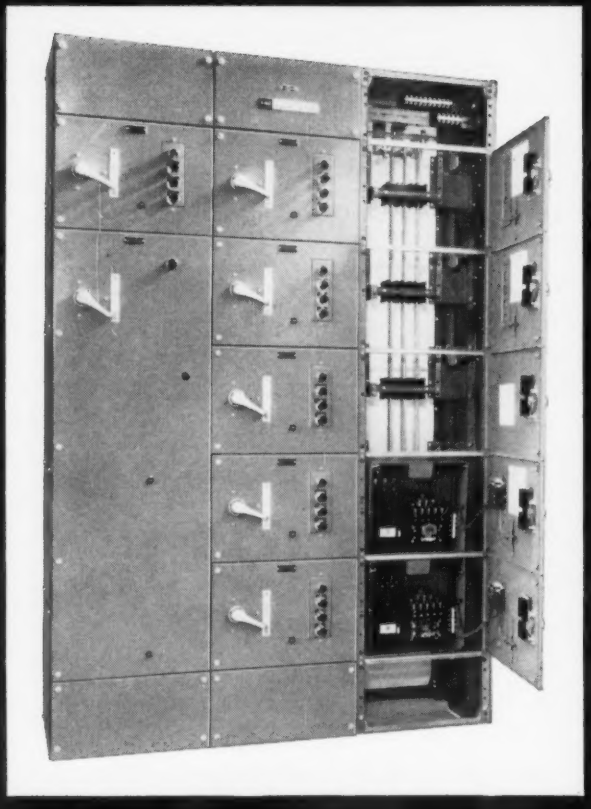
POWER TRANSFORMERS

PENNSYLVANIA TRANSFORMER

Another Engineering Achievement

In Control Centers...

Federal Pacific gives what you're looking for



RELIABILITY

BOLTED CONSTRUCTION— 11-gauge formed channels bolted together for maximum structure rigidity.

POSITIVE PLUG-IN CONTACTS— special beryllium copper alloy stabs provide high-pressure, low-resistance unit-connections to silver-plated bus.

TESTED TO WITHSTAND 25,000 AMP RMS SHORT CIRCUIT STRESSES.

FLEXIBILITY

PREPUNCHED STRUCTURES— for unmatched job flexibility...individual units or complete sections can be added, removed or interchanged to meet varying job requirements—present and future.

COMPACT DESIGN— up to 20 units can be mounted in a single vertical section.

EASY WIRING— oversize wiring spaces simplify initial installation and facilitate change of units.

SAFETY

UP-FRONT UNIT RELEASE— completely disengages unit from energized bus... can be locked in open position to prevent accidental contact.

FULLY ENCLOSED UNITS— steel barriers isolate each unit from adjacent parts.

DOORS MOUNT ON STRUCTURE— prevent accidental contact with energized bus when starter unit is removed.

Nothing has been left to chance in the design of this control center. Structure, starters, and protective devices have all been carefully engineered, manufactured and coordinated by Federal Pacific to assure the highest standard of operating efficiency and dependability—as well as to provide unified responsibility for performance. For complete details write for Bulletin 2-2000A, Federal Pacific Electric Company, General Offices: Dept. 305, Newark 1, New Jersey.

FPE

FEDERAL PACIFIC ELECTRIC COMPANY

The Best in Electrical Distribution and Control Equipment

The Electrical Week

LATE NEWS ▶

AIEE nominations . . . J. H. Foote, Commonwealth Services, for president; D. L. Green, Gilbert Associates; J. W. Davis, Southern Bell T&T; M. H. Knight, Bureau of Reclamation; R. Dupuis, Quebec Hydro; and F. S. Bacon, Gamewell Co—all for vice presidents.

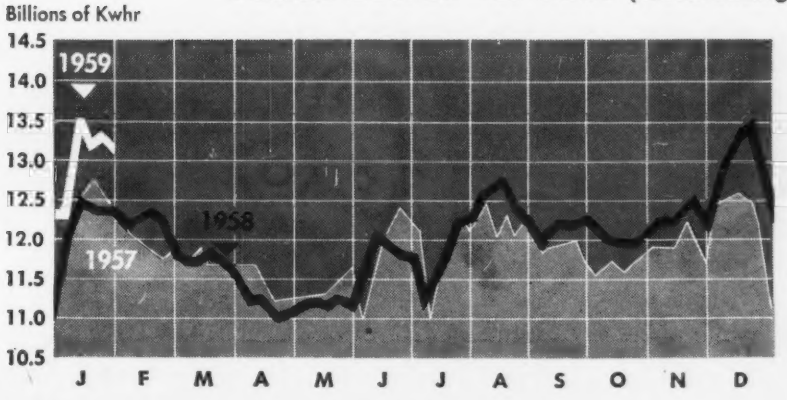
Philadelphia Electric to study decentralized peak-shaving, using 4,200-kw prototype diesel generating unit on a trial basis. Super-chargers to boost capacity of remote controlled, unattended units to 6,000 kw in May. This may mark beginning of a trend.

Washington Wire . . . Sen Kerr introduces TVA bond-financing bill identical to his of last year and to the one introduced in the House two weeks ago . . . Joint Committee on a A-Energy gets four new Republicans: Sens W. F. Bennett (Utah) and G. D. Aiken (Vt.); and Reps W. H. Bates (Mass.) and J. Westland (Wash.) . . . Hearings on possible integration or interconnection of U. S. private and public power systems to produce the "greatest possible efficiency and economy" have been called for by Sens Murray (D-Mont.), Neuberger (D-Ore.), and Carroll (D-Col.). Murray said this nation should organize its electric power industry into large integrated systems for the greatest efficiency and economy . . . This nation cannot take the haphazard approach to the development of giant power grids.

13,500 AFL-CIO workers strike at eight Allis-Chalmers plants. Of these plants, only four make electrical equipment. 3,500 workers remained on the job at Norwood, Ohio and at the York, Pa., plant, formerly owned by S. Morgan Smith.

Obituaries . . . E. Phillips, 85, founder and former president of Long Island Lighting, dies in New York City. Electrical industry victims of last week's N. Y. air crash: B. J. Martin, Electrified Industry; E. Evans, Kellogg Switchboard; and C. Howlett of GE.

POWER OUTPUT—UP 7.5% (Week ending Jan. 31), Kwhr 13,151,000,000



Per Cent Change From Previous Year

	Jan. 17	Jan. 24	Jan. 31
Total U. S.	+ 7.5	+ 8.0	+ 7.5
New Eng.	+ 7.7	+ 8.2	+ 8.8
Mid. Atlantic ..	+ 5.3	+ 6.5	+ 7.7
Cent. Ind.	+ 9.5	+10.8	+10.2
West Cent.	+10.0	+12.5	+12.2
Southeast	+ 5.0	+ 4.6	+ 0.9
South Cent.	+10.7	+10.7	+12.1
Rocky Mount...	+ 6.6	+ 8.2	+ 4.8
Pacific			
NW	+ 8.4	+ 7.4	+ 8.1
SW	+ 6.6	+ 6.3	+ 9.4

Seasonally Adjusted Index 244.7

Week Ago 245.2 Year Ago 226.9

Source: Edison Electric Institute

Preview of this Issue

EVENTS ▶ **National Electrical Week gets underway** at some 160 utilities and manufacturers, according to NEW Chairman N. J. MacDonald **(p 44)** . . . The first electric sports car will be coming off the production lines in a few weeks and is slated for Atlantic City Electric Co. Increasing interest in the car is reflected in 47 firm utility orders for it **(p 45)** . . . Sen Clinton Anderson calls for a truce in private-vs-public power battle as it applies to the atom, in order to push U. S. A-power development **(p 47)** . . . Securities & Exchange Commission stirs up big debate on how to account for credits equal to temporary tax reductions when utilities use liberalized depreciation **(p 50).**

ENGINEERING ▶ **Take a big switchyard, modify it to meet skyrocketing loads,** and you have the story of what's been done to the 138-kv yard at American Electric Power's Philip Sporn plant. Details begin on **page 51** . . . You may be spending dollars needlessly on minor materials handling. Georgia Power set up a simple system for handling them which it claims cuts costs while improving morale and quality **(p 58)** . . . Better cooperation among utility representatives, consulting engineers, and industrial power users results in better electrical protection for customers, says Portland General Electric Co protection engineer M. A. Bostwick **(p 54).**

Politics and Public Power

SEATON ON POWER COOPERATION

Interior Secretary Fred Seaton made another appeal last week for cooperation between federal, public, and private power systems in the United States—this time before the Nebraska Rural Electric Assn in Lincoln. "To make electric power development a political football is the surest way to kick it to pieces," he emphasized.

He also repeated the possibility of a court test for the controversial power contract, signed in 1952 between Southwestern Power Administration and Arkansas Power & Light Co, for power sales to Reynolds Metals Co at Arkadelphia, Ark.

Seaton pointed to a recent FPC estimate that "by 1980, the gigantic amount of generating capacity which we now have will have to be nearly tripled . . . it will mean an investment in generating, transmission, and distribution facilities of more than $100 billion. Now who's going to pick up that tab, as it were, which amounts to $5 billion a year? Uncle Sam? Not so. The Congress has never voted that kind of money for power development . . . The plain fact is this: the job has got to be done by cooperation among all power systems.

CRITICIZES VIEWS OF 'EXTREMISTS'

He criticized the "narrow view" of "loud extremists . . . Their feet planted deep in the soft soil of the 19th century," who claim "The U. S. Government has no business whatever building hydro plants and transmission lines."

And, he added, "On the other side are equally noisy people who have made a career out of battling the investor-owned power companies. For example, Clyde Ellis, general manger of the National Rural Electric Co-

MANAGEMENT ▶ **Regulatory relations need improvement,** according to R. S. Quig, manager of Ebasco Services' Rate Department. Our cover story is based on Quig's recent outline of the regulatory climate in the U. S. before the New York Society of Security Analysts. Among his other points, detailed on **page 75,** Quig calls for increased utility management recognition of the importance of regulation.

MANUFACTURERS ▶ **Westinghouse reveals two major transformer developments:** (1) The first installation of an inter-cooled 50-Mva unit; and (2) An aluminum tank for pole-type distribution units . . . General Electric gets 200-Mw turbine-generator order from New England Power Co **(p 66).**

NEW EQUIPMENT ▶ **Capacitor racks made of welded aluminum reduce equipment weights** by as much as 11% . . . Welded bushings are available on network transformers. Made of alumina, their strength is reportedly five times that of porcelain . . . Power fuses offer full range of protection from 7.5 to 161 kv **(p 80).**

PEOPLE ▶ **New presidents** . . . J. R. Morton at Memphis LG&W; R. V. Sear and M. C. Titus at American & Foreign subsidiaries. These and other personnel changes beginning on **page 84.**

operative Assn, has asserted again and again that the Eisenhower Administration has a top-secret Master Plan to destroy the REA co-ops."

Seaton refuted Ellis' charge that the present Administration was responsible for a controversial 1952 power contract between SWPA and Arkansas P&L, and added, "I am hopeful that it will be possible to get a court test" of the contract. Seaton has mentioned this desire in earlier speeches, and the matter still is under study by attorneys in the Justice and Interior Departments (EW, Nov. 3, p 48).

The Secretary said Ellis had singled out the fact that in 1957, "REA (co-op) rates were raised in the area served by SWPA, while private utility rates there remained unchanged" in order to "prop up his 'master conspiracy' allegation . . . but Mr. Ellis forgot to mention that it was a Democratically controlled committee of Congress back in 1952 which enunciated the principles upon which the new (co-op) rates had to be based." Seaton added that the 1957 action "merely brought the REA's in the Southwest into line with those in your area and others."

MOSES GETS NO PROMISED LAND

An unexpected bombshell was dropped on the Niagara Falls power project last week when FPC ruled that N. Y. State Power Authority cannot build its proposed storage reservoir on Tuscarora Indian land.

The FPC's 3-2 decision, which came after District of Columbia U. S. Court of Appeals remanded the issue to the Commission last November, will be reappealed by NYSPA.

Last month the Indians rejected Authority Chairman Moses' "final offer" of $3-million plus fringe benefits for the land. If Moses gets no satisfaction from the court, he will go ahead with a smaller reservoir off Indian land.

Combining gas and steam turbines brings improvement in heat rates ranging from 4-5% for a 4,500-psig, 1,100/1,050/1,000F cycle to 8-9% for an 850-psig, 950F cycle. Attractive gains are possible because maximum temperature at which heat is added to a working medium is increased while temperature at which heat is rejected is not varied. **A. O. White, Combining the Gas-Turbine and Steam-Turbine, Mechanical Engineering, December 1958**

About one-half million US homes now are heated electrically. The South has 55%, the West 36%, the Midwest over 7% and the Northeast almost 1.4%. Because of air conditioning, summer peaking among utilities rose from 30% in 1957 to 41% in 1958. **Electric Heat and Air Conditioning, November-December 1958.**

TECHNICAL NOTES

Tiny contactless thermal switches will provide reliable and precise over-temperature protection for large hermetically-sealed motors. The switches are thermistors, whose resistance increases abruptly when a specified temperature is attained.

Cold load pickup after a prolonged outage may be eased as new circuits are designed to carry substantially all the connected space-conditioning equipment.

Transistorized inverter circuit provides ac from dc without any moving parts. Uses include operation of a single hot cathode fluorescent lamp from a low-voltage dc supply.

FROM EDITORS IN THE FIELD

Maintenance is almost eliminated in switch houses of porcelain-covered steel, inside and out, reports a southeastern company. The fiber-glass insulated buildings contain relays, supervisory equipment and associated gear.

A 6% reduction in the cost of a double-circuit steel tower line, or a $3,720/mile saving, is the estimate of Union Electric Co for a design that ignores the broken-conductors assumption.

Steam turbine will drive the boiler feed pump for the 225-Mw Unit 2 at Portland generating station of Metropolitan Edison Co. The turbine is rated 9,800 hp, 6,650 rpm to run on steam at 490 psia, 640F.

WHEN PROLONGED OVERLOAD overheats the transformer windings, top oil temperature rises; tank wall gets hotter; and the L-M Thermal Overload Indicator drops its red signal light or luminous yellow tube to indicate the overload. No interruption of service; no costly periodic load checks. Fits any make of conventional transformer up to 100 kva.

Utilize Full Transformer Overload Capacity With L-M Thermal Overload Indicator

Cuts costs of load checks; helps maintain continuity. Alnico magnetic mounting bracket makes installation easy on *all* makes of conventional transformers. Choice of red signal light or luminous yellow tube signal.

Utility companies have been buying L-M's Type D Thermal Overload Indicator in large quantities for a number of reasons. The unit is simple; it is easy to install; and the cost is less than a $10 bill.

The indicator eliminates costly periodic load checks, by providing a *continuous* load check instead. It helps prevent transformer burnouts by giving ample warning. In addition, it avoids service interruptions because it doesn't cut off the transformer load; it simply *indicates* the existence of an overload.

L-M's indicator, compensated for ambient temperatures, measures tank-wall temperature, which in turn reflects top oil and hot-spot temperatures. It indicates a prolonged overload with a red light that drops down and turns on, or with a drop-down luminous yellow tube.

The small cost provides a most favorable return in both savings and service continuity. Ask the L-M Field Engineer for Bulletin 57105 or a sample. Or write Line Material Industries, Milwaukee 1, Wisconsin.

ALNICO PERMANENT MAGNET holds the L-M overload indicator firmly to the tank wall.

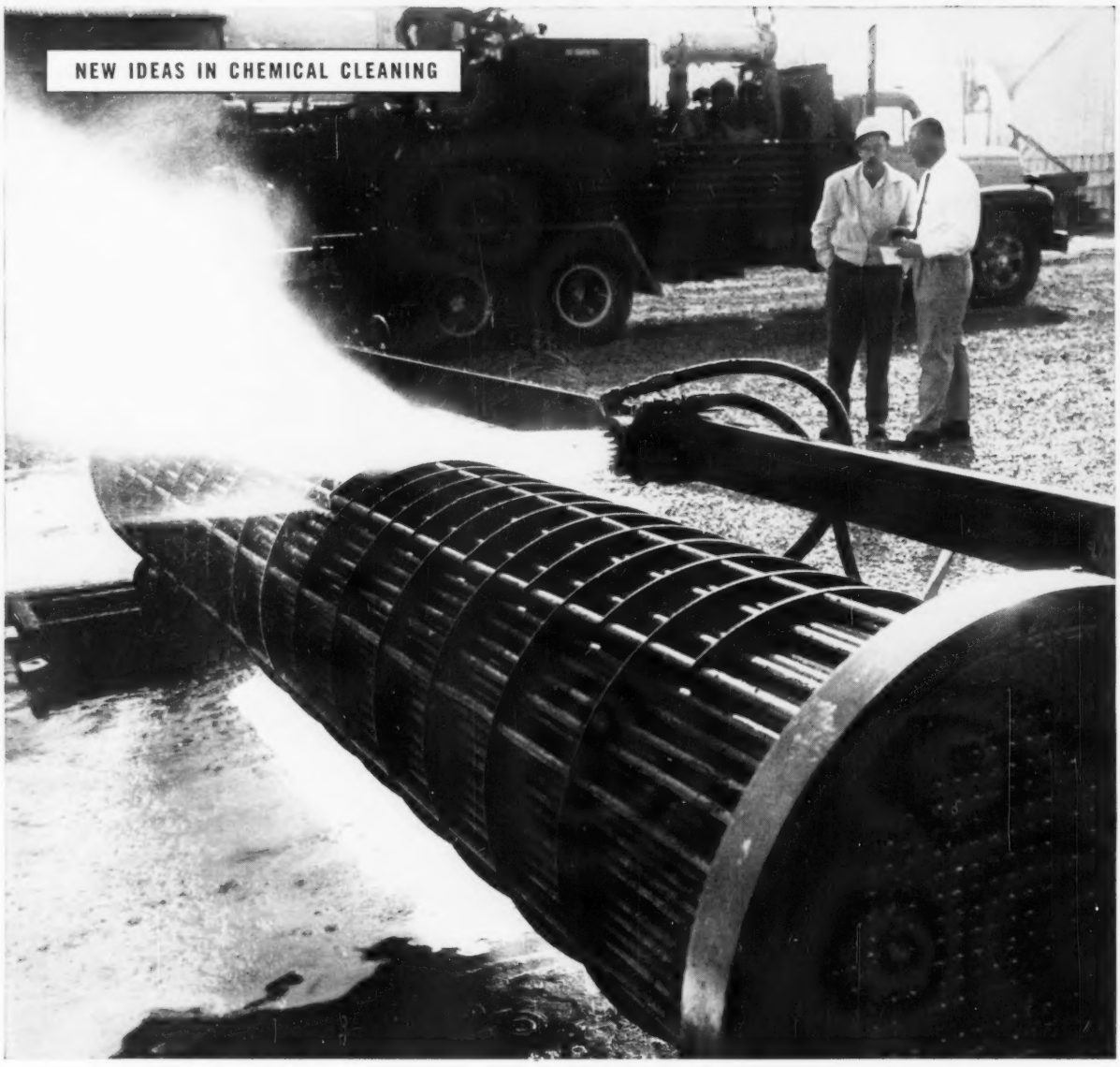
LINE MATERIAL® Industries

McGRAW-EDISON COMPANY

Protective Equipment

381

DISTRIBUTION TRANSFORMERS • KYLE RECLOSERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS • POWER SWITCHING EQUIPMENT
PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING • LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT



New Jetting Tool To Clean Tube Bundles Saves Thousands Of Dollars

The new high-pressure hydraulic tool, shown above, is currently saving thousands of dollars for companies in the refining, chemical, and petrochemical industries. It is the jetting tool developed by Dowell to remove deposits from heat exchanger tube bundles.

Previous methods of cleaning these bundles have been costly, time-consuming and often inadequate. Many times bundles had to be replaced completely because of the lack of a suitable cleaning method.

This new Dowell tool has a remarkable record of thorough, fast cleaning. For example, a slurry reboiler exchanger bundle, three feet in diameter and 16 feet long, was fouled with deposits of coke and asphalt. After being jetted from only one side, the bundle was thoroughly clean. Time required: less than one hour.

The tool holds the bundle in place for cleaning and has flanged rollers for rotation. The jet-head is manipulated automatically so that all tube spaces are covered. The jetted liquid can be either water or chemical solvents.

This high-velocity jetting device is another example of the new ideas Dowell continues to offer in chemical cleaning to help you cut your costs. Whatever the cleaning problem in your plant, call Dowell for an engineered recommendation. Dowell — the largest, the oldest, the most experienced chemical cleaning service — Tulsa 1, Oklahoma; and 165 stations and offices in major industrial centers.

Chemical cleaning service for all industry DOWELL
DIVISION OF THE DOW CHEMICAL COMPANY

the price is RIGHT!

TYPE M STRAND

If someone asked you the price of Copperweld Strand, the chances are that you'd err on the high side. Why?

Simply because this permanently non-rusting guy and messenger strand has for more than 40 years been rated absolute tops in its field. Judged by the admittedly longer service and maintenance-free life its use assures, you'd naturally expect it to cost more—much more. But that's no longer true.

Now, with the new Type M Strand, you can obtain all the money-saving and performance advantages of Copperweld construction at a price comparable to that of ordinary strand. This was made possible by developing new higher strengths especially suited for guy and messenger use, and introducing new cost-cutting production techniques.

Pliable and easy to handle, this superior strand is available in a complete range of breaking strengths. Ask us to quote on your guy and messenger requirements. You'll find the price is right.

COPPERWELD STEEL COMPANY
WIRE AND CABLE DIVISION *Glassport, Pa.*
For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, New York

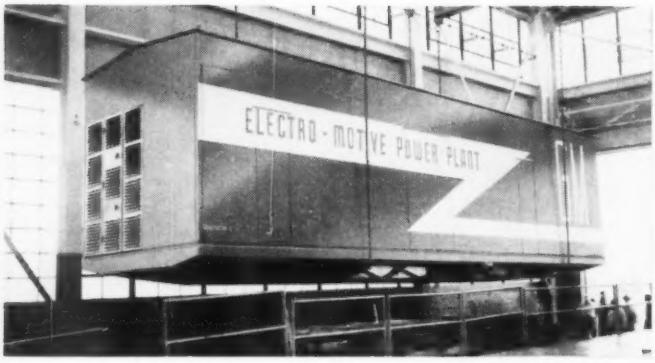
Furnished in coils of 250, 500 and 1,000 feet depending on the size. Reels of 2,500, 5,000 and 10,000 feet are also available.

Copperweld®

TYPE M™

GUY and MESSENGER STRAND

PEAKING POWER FOR



ELECTRO-MOTIVE 6000 KW PEAKING PLANT .... $85 per KW

Includes: three generators, one control unit F.O.B. Electro-Motive factory, La Grange, Illinois.

The following installation costs were based on the plant pictured here. If your requirements approximate this typical installation, you can put 6,000 Kilowatts of peaking power into operation on your system for $100 per KW or less.

Land was estimated at a dollar per square foot, shipping costs for 1000 miles. Even supervisory control (however you wish to operate the plant—push button, time mechanism, current sensing equipment, etc.) is included. A transformer is also charged, but if you do not need one, deduct it from your estimate.

LAND, PREPARATION, SHIPPING .... up to $3.50 per KW

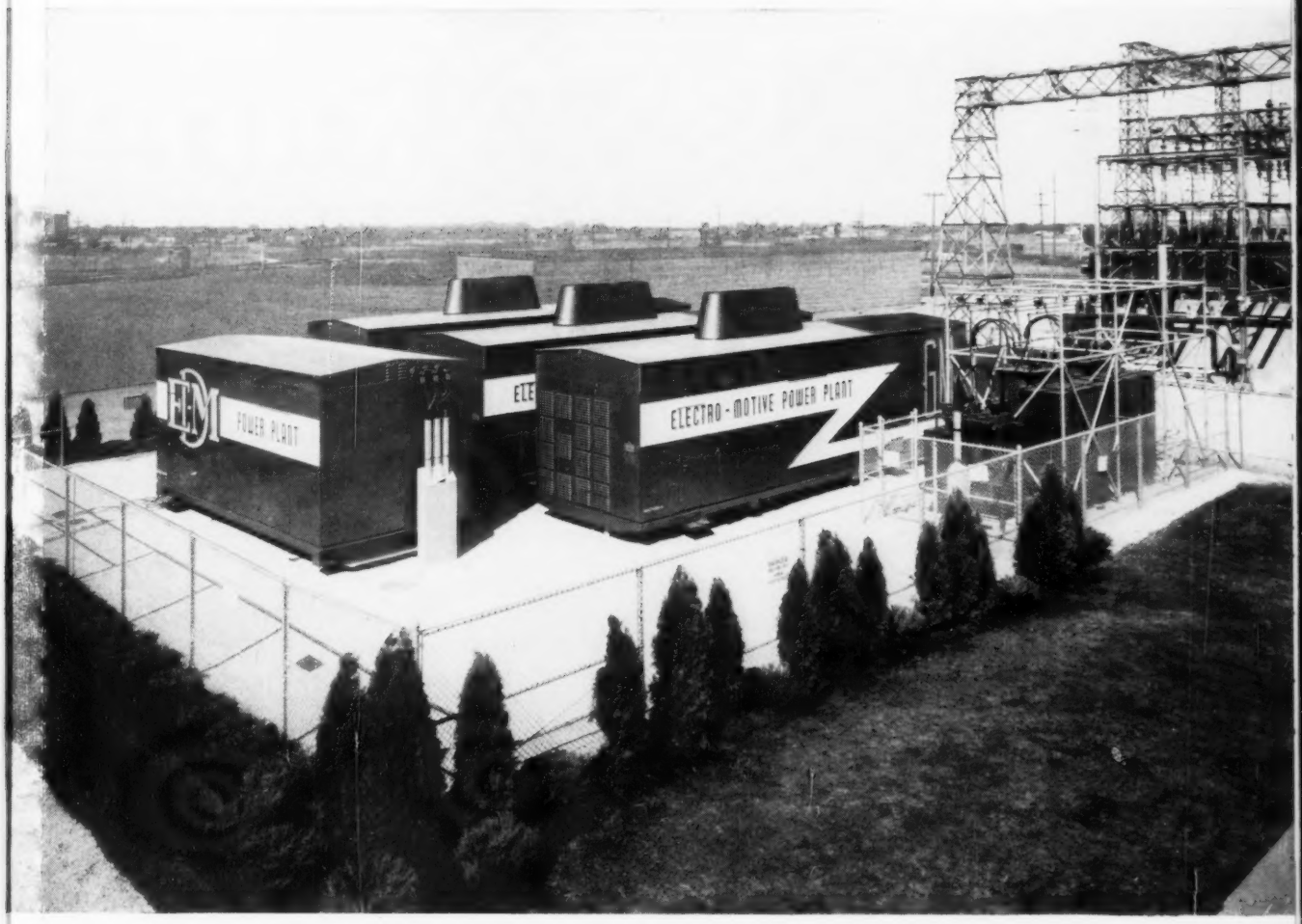
Includes: shipping (1000 miles from factory), 4000 sq. ft. land, grading, fill, leveling, tie foundations, positioning units, fence.

CONNECTING: FUEL, ELECTRICAL .... up to $11.50 per KW

Includes: purchase and installation above ground fuel tank, piping, cable, transformer and supervisory control.

Total installed, Operating plant .... up to $100 per KW

$100 PER KW–INSTALLED

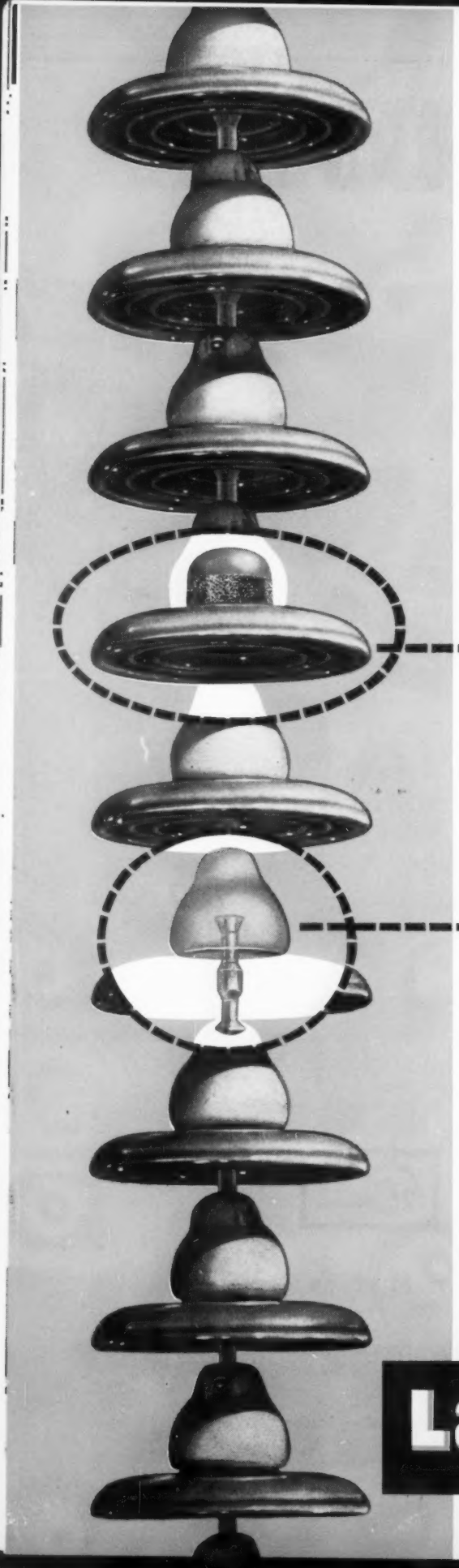


This is the complete 6,000 KW plant as it might appear on your system. It operates completely unattended. It starts fast (cold start to full rating in less than 90 seconds) to satisfy peaking or spinning reserve requirements. It is quiet, attractive—makes a good neighbor. It is readily transportable to meet changing needs. And most important, it is made and backed by *one company*. You have only one manufacturing and service responsibility for the complete plant. See your Electro-Motive representative for complete details.

ELECTRO-MOTIVE DIVISION
GENERAL MOTORS • La Grange, Illinois

Sales-engineering offices:
Chicago, New York, St. Louis, San Francisco

In Canada:
General Motors Diesel Limited, London, Ontario



GOT AN INSULATOR CORROSION PROBLEM?

Competent transmission system design calls for selection of components matched to each other in useful-life-expectancy. It often is the case, in areas of salt spray and/or industrial contamination, that rusting out of suspension insulators may be the first sign of a line "wearing out"—years before conductors or structures are in need of replacement. For such lines now being constructed or planned, the need for high-line maintenance or future reinsulation—and its high cost in skilled labor, transportation, and materials—can be avoided. Lapp suspension insulators are available, on specification, with cap and bolt components in a variety of corrosion-resistant alloys. We now have a lot of test data and installation records to help us, and you, to predict performance of these metal parts over periods of varying conditions of weather, concentration of corrosive action, prevalence of contamination, leakage currents and corona. Ask your Lapp representative about it—or write direct to us.

the porcelain is "forever"

Lapp vacuum process porcelain, with balanced compression-glaze "fit," has been proved—over millions of pieces, in thousands of shapes—the "most dependable insulation material on any system." Suspension discs are offered in standard (15,000-lb.) strength, high (25,000-lb.) strength, and heavy-duty shells. Fog-type units in same standard and high strength ratings, for either 5¾″ or 6½″ spacing.

the hardware by specification

FORGED STEEL hot-dip galvanized, standard for caps and bolts. Smooth contours and uniformity of galvanizing have improved corrosion resistance over earlier insulators.

MALLEABLE IRON for caps only. Hot-dip galvanized, it is approximately equivalent to standard forged steel in corrosion resistance.

LOW-ALLOY STEEL hot-dip galvanized. For caps and bolts. Offers four to six times greater resistance to corrosion than forged steel. Nominal price premium.

DUCTILE NI-RESIST for caps only. Considerably lower in cost than stainless, is second only to stainless in resistance to most forms of atmospheric corrosion.

STAINLESS STEEL has highest resistance to corrosion of any material. Used principally for bolts, can be furnished for caps where severity of operating conditions justify the cost.

ALUMINUM-SILICON-BRONZE for caps and bolts under special chemical atmospheres where its resistance exceeds that of stainless.

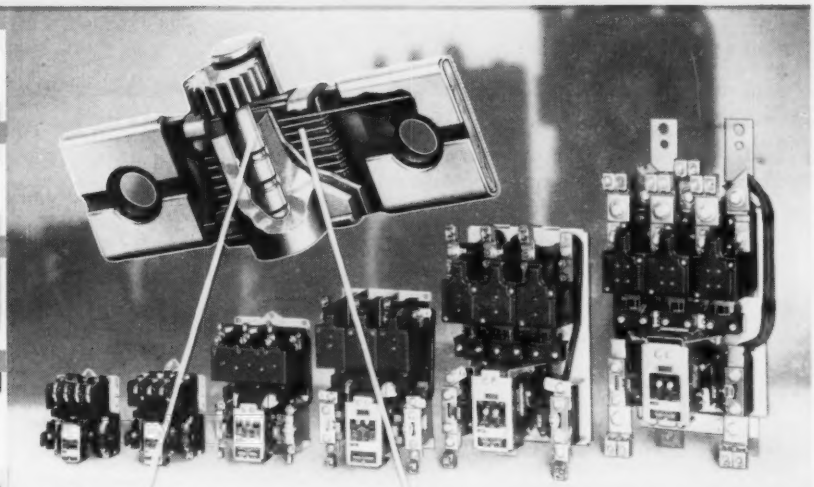
Lapp

Lapp Insulator Co., Inc., LeRoy, New York.

When you buy Motor Starters——

YOU PAY FOR OVERLOAD PROTECTION

...BE SURE YOU GET IT!



Heat-responsive element (solder pot) provides accurate response to overload, yet prevents nuisance tripping.

Heat-producing element is an integral part of overload unit. It's permanently joined to solder pot, can't become misaligned.

Only ONE-PIECE Overload Relays can give 100% Protection Only with ONE-PIECE construction can you *know* you've installed the heater correctly. Only with ONE-PIECE construction can you *know* the heater is exactly centered, or properly positioned, so that it performs according to its rating. Only with ONE-PIECE construction can you *know* your starters will not operate without the thermal units properly installed. Only with ONE-PIECE construction can you *know* your motors have full protection.

Only Square D has ONE-PIECE Construction ONE-PIECE construction *eliminates* any possibility of heater misalignment. Square D melting alloy thermal overload relays can be installed only one way. They are tamper-proof. They are factory-assembled, are *individually* calibrated and tested. Repeated tripping will not affect their accuracy.

Insist on Square D starters with melting alloy thermal overload relays

LET US PROVE IT!

Let your Square D Field Engineer show you **1** how one-piece construction is accomplished and how easy it is to mismatch separate heaters and solder pots— **2** an endurance tester to prove that overload units can be reset repeatedly without damage while the solder is liquid— **3** a tripping time tester to compare various types of melting alloy units and to prove that tripping time won't change after repeated operation.

***Write** for Bulletin SM-275 for the complete story on Square D starters with ONE-PIECE thermal overload relays. Address Square D Company, 4041 N. Richards St., Milwaukee 12, Wisconsin*

SQUARE D COMPANY

These S&C Cutouts reduce by shortening the arc,

As any lineman who has closed a cutout on a heavy fault knows, there's a violent blast of flame and "shrapnel." There are three ways to cut down this hazard:

1. Reduce the amount of fuse tube liner (fibre) exposed to the arc.
2. Reduce the energy of the arc.
3. Increase the bore diameter* to reduce the "muzzle velocity."

In S&C's Cutouts having interrupting ratings above 5000 amperes, all three methods are employed — together — making possible the exceptionally high interrupting ratings and at the same time reducing the violence of the blast.

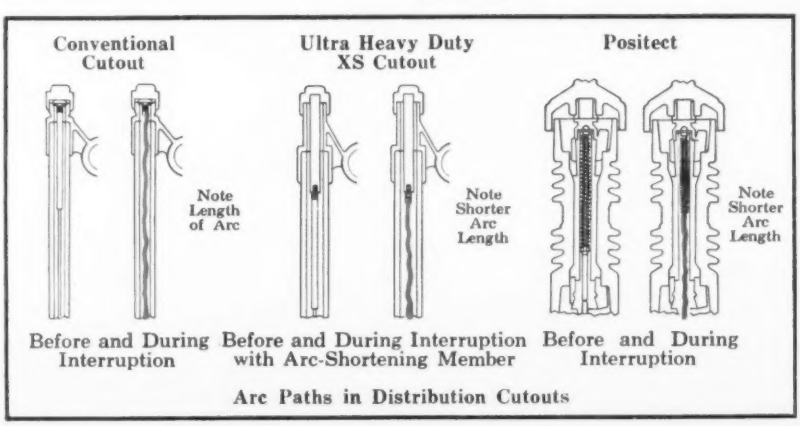
*This can be done without sacrifice of low fault interrupting capability by use of a fuse link made to interrupt low faults, in combination with a high speed terminal-separating device. In the Positect, this latter is a spring and cable assembly; in the XS, a spring-actuated cable flipper.

Here's how it's done:

The length of the arc is deliberately reduced by the use of an arc-shortening member. In the XS Cutout, this member is a husky copper rod; in the Positect, the member is a spring-and-cable assembly.

When the arc length is reduced, the arc voltage is reduced, and in turn the energy in the arc is reduced. At the same time, the arc has less fibre to act upon, and hence less gas is generated. Finally, with a somewhat larger bore in which to expand, the gases are not as violently accelerated out of the cutout's open end.

The result: less energy, less flame, less violence, and less hazard. And while such performance is of special importance at the highest fault levels, this same reduction applies proportionately across the entire range of faults.



Arc Paths in Distribution Cutouts

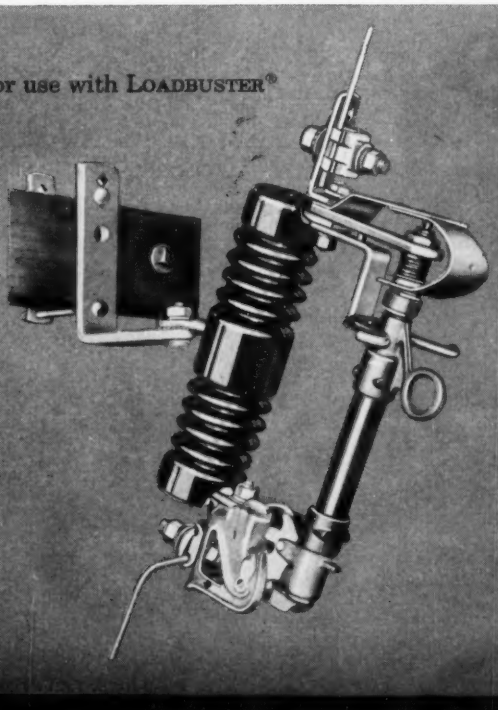
Ad No. 5815
Printed in U. S. A.

For voltages up to 14.4 kv

XS CUTOUTS

Open cutouts designed for use with LOADBUSTER®

This open cutout is designed for use on modern distribution systems to provide for the two performance factors of most concern: reliable interruption of the heaviest faults with minimum violence and to provide repetitive load switching capability. Available in Extra Heavy Duty and Ultra Heavy Duty styles with arc-shortening rod at 7.2 kv and 14.4 kv. (Also Heavy Duty styles at 7.2 kv, 14.4 kv, 25 kv, and 34.5 kv.) The XS Cutout can switch full rated loads up to 200 amperes with disconnect blade at 14.4 kv when used with LOADBUSTER, the portable loadbreak tool.

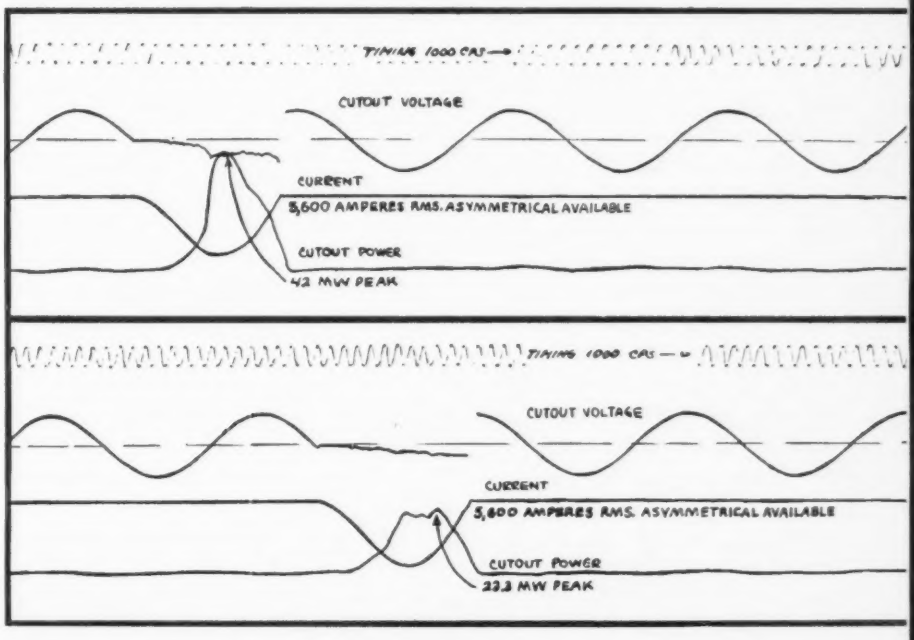


exhaust blast reducing the energy

Here's the proof:

This pair of oscillograms shows how "arc-shortening" reduces the arc energy. The upper oscillogram is taken from a test on an XS Cutout *without* an arc-shortening rod; the lower is *with* an arc-shortening rod. Note that the peak power—a measure of blast violence—is virtually cut in half, from 42 megawatts without the arc-shortening rod to 23.3 megawatts with the rod. But the available fault current being handled by the arc-shortening rod is exactly the same, 5600 amps rms asymmetrical. Note also that the maximum arc voltage has been reduced 50%. This is indirectly a measure of the reduced power in the arc.

For additional information: S&C Electric Company, 4421 Ravenswood Ave., Chicago 40, Ill. In Canada: S&C Electric Canada, Ltd., 8 Vansco Road, Toronto 14, Ontario.



For voltages through 4.8 kv

POSITECT CUTOUTS

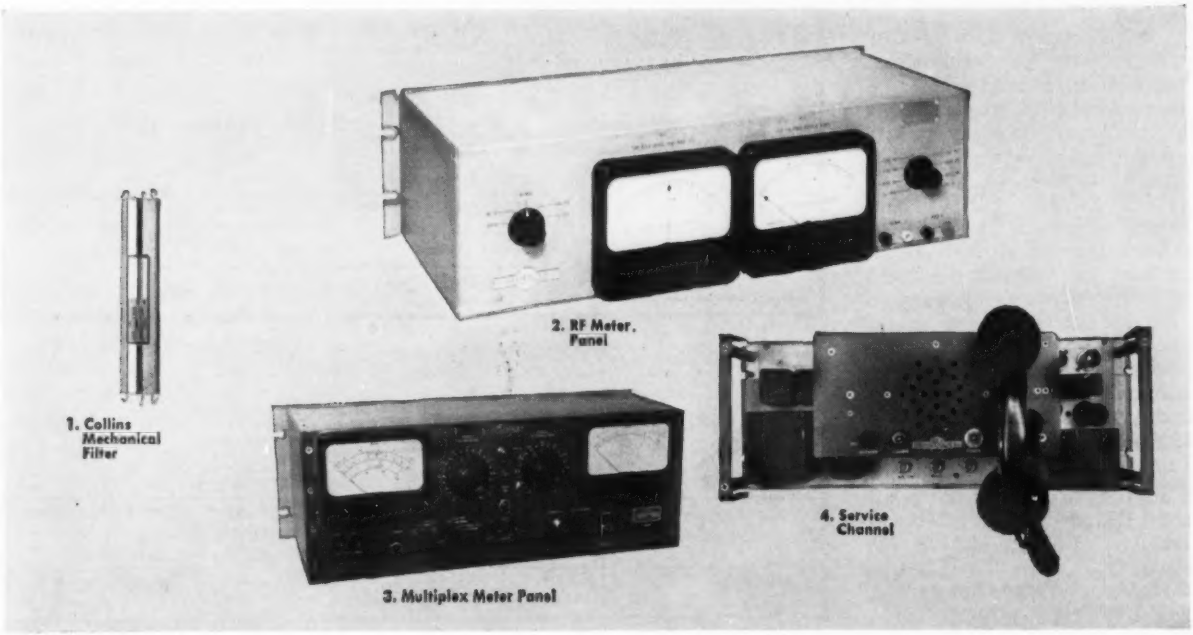
Enclosed cutouts with full load switching capability

The S&C Positect is the only enclosed cutout with full load switching capability, without external arc or exposed hot parts. Will switch up to 300 amperes with disconnect tube. Note interrupter attachment which permits full load switching. Designed and tested for closing against faults. In case of fault closing, all blast is directed away from operator.

Specialists in High-Voltage Circuit Interruption Since 1910

Here are some Collins Microwave features that can cut your maintenance costs

The electrical and mechanical design of Collins Microwave systems insures low maintenance costs and reduces circuit outages to the absolute minimum



1. Single sideband suppressed carrier multiplexing is simplified and made more economical by the use of Collins' Mechanical Filter. The steep skirt attenuation prevents co-channel crosstalk. The filter is a small, permanently tuned, hermetically sealed unit. Deterioration of system performance by coil aging, humidity, and other detrimental effects is eliminated.

2. Metering and control facilities for preventative and corrective maintenance are built into the equipment. On the front of the RF rack is a self-contained meter panel to check transmitter and receiver oscillator repeller and beam currents and voltages, discriminator balance, received signal levels, mixer crystal current (local oscillator frequency), transmitter frequency reference, transmitter power and relative antenna power. In addition the panel may be used as a voltmeter or milliammeter, using external test leads, to measure at test points throughout the RF, coupling, and multiplex equipment.

3. A test panel for the multiplex equipment provides metering facilities for level measuring and setting, and general purpose audio measurements.

4. The Collins Microwave service channel provides simultaneous voice transmission and reception, with signaling, among all stations in a system on a party line basis. Direct modulation of the microwave equipment is employed without using the carrier facilities.

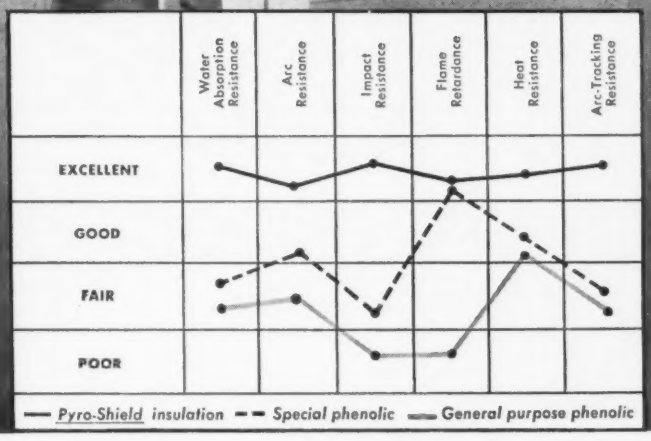
Collins Engineering staff at your service

Our engineers will assist you in evaluating, planning and installing Microwave equipment. Write or call today for further information on Collins Microwave Equipment: Texas Division Sales, Collins Radio Company, 1930 Hi-Line Drive, Dallas 7, Texas.

COLLINS

COLLINS RADIO COMPANY • DALLAS • CEDAR RAPIDS • BURBANK

Allis-Chalmers New 4.16-kv Metal-Clad Switchgear



PROTECTED WITH PYRO-SHIELD INSULATION ALLIS-CHALMERS

New Pyro-Shield Track-Resistant Insulation

Track-resistant *Pyro-Shield* insulation is a polyester glass base material now used in Allis-Chalmers coordinated system of switchgear insulation.

One molding connects primary disconnects to bus bars to provide uniform insulation and reduce the number of insulation components.

In addition to being track resistant, *Pyro-Shield* insulation has high impact strength, which eliminates risk of damage from short-circuit stress and assures low moisture absorption.

Other advantages are: high flame retardance; long life — even at high temperatures; resistance to chemical fumes; and bus joint construction that eliminates need for skilled taping techniques.

Get details on this new insulation and other Allis-Chalmers switchgear features, including the low 72-inch silhouette and new *Shelter-Clad* design. Contact your nearby Allis-Chalmers office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

For Progress in Switchgear

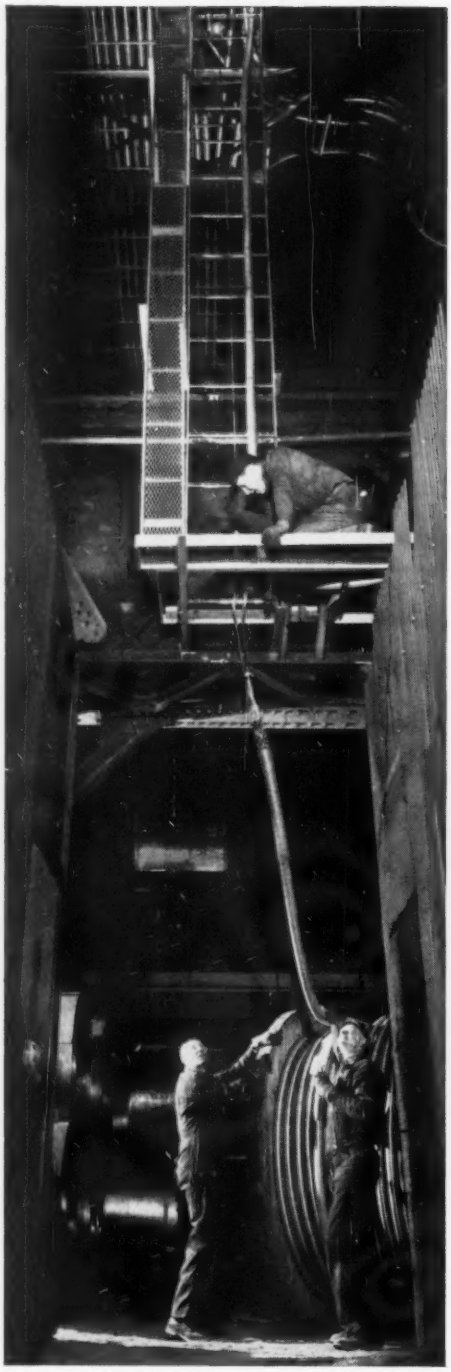
ALLIS-CHALMERS

A-C ALLIS-CHALMERS

Pyro-Shield and Shelter-Clad are Allis-Chalmers trademarks.

A-5862

If you want to be sure install Tiger Brand



Cable is pulled through the racks. Pulleys ease it through at each turn.

SINCE we've been making electrical cable at American Steel & Wire since 1891, customers often ask us how they can best plan for *future* wiring needs. They've seen the shocking cost of plant modernization programs in buildings that were not designed with foresight.

Electrically speaking, you're going to need a *flexible* wiring system, one that can be enlarged or revamped with ease. To lots of designers today, that means a feeder system that is *not* permanently sealed in rigid conduit, frequently buried under tons of concrete and, in case of damage, frequently unrepairable. All of these problems are solved when you install flexible Armorlokt in an open-rack system.

Initial installation is not difficult. Extra feeders can be added easily at any time. Special feature: Splices can be made *anywhere* along the cable's length. The pictures on these pages show how adaptable and flexible such a wiring system can be.

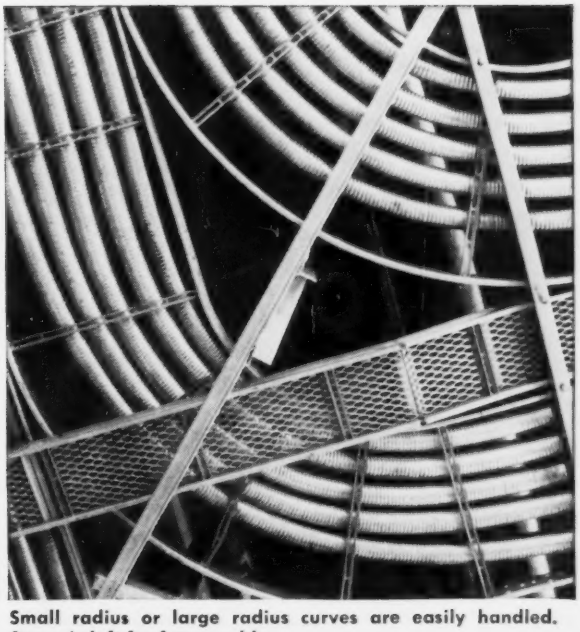
Tiger Brand Armorlokt is made in a complete range of sizes and constructions. Ask your AS&W salesman. American Steel & Wire. Gen'l Offices: 614 Superior Ave., N.W., Cleveland 13, O.

USS American Steel & Wire Division of United States Steel

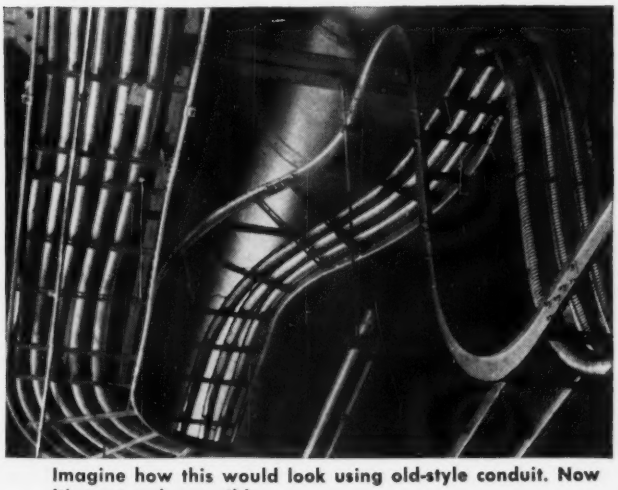
Winch on truck does the pulling. Crew members talk to each other with telephones.

# of adequate wiring in 1979, Armorlokt now!

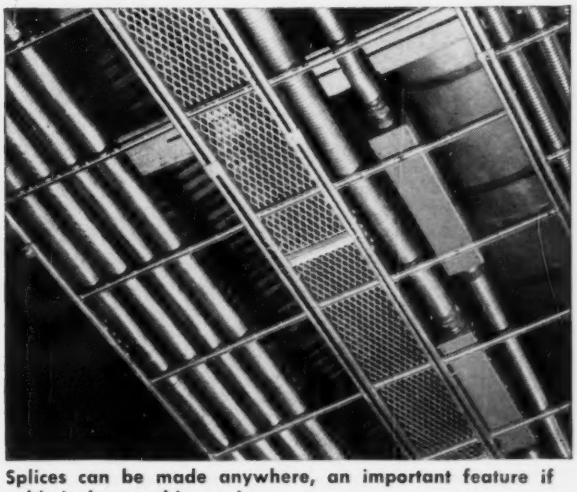
Armorlokt terminates easily. Flexibility of the cable eliminates fussy joint work.



Small radius or large radius curves are easily handled. Space is left for future cable.



Imagine how this would look using old-style conduit. Now it's neat and accessible.



Splices can be made anywhere, an important feature if cable is damaged in service.

USS Tiger Brand Electrical Wire & Cable

A standard cable for every special job

- Asbestos Wire and Cable
- Mold Cured Portable Cord
- Shovel & Dredge Cable
- Paper & Lead Cable
- Varnished Cambric Cable
- Interlocked Armor Cable
- Special Purpose Wire & Cable
- Aerial, Underground and Submarine Cable

USS, Tiger Brand and Armorlokt are trademarks

DOW | HERBICIDES

NOW—trained Dow field men

The man in the business suit is a transmission engineer who had a hunch he wasn't getting his money's worth from chemical vegetation control. He called his Dow field service man to take a close look.

On-the-spot inspection was just in time. What had looked like a thorough vegetation control job last fall was showing shortcomings with the full flush of growth. The wrong choice of material had failed to finish off a troublesome stand of oak. Stumps not properly treated were beginning to re-sprout. Places that should have needed only a touch-up spraying this year now needed a full treatment *—with the right formulation.*

When he finished his examination, the specialist from Dow had plenty of profitable advice to offer. He showed which application method to use . . . prescribed the correct dosage and timing for application of Veon*, Esteron*, 245 O.S., and Kuron*. The result: this utility will save real money from this season on . . . and get better vegetation control than ever before.

Right now is the time to re-evaluate your vegetation control program. A trained field service man will gladly accompany you or your spraying contractor on an inspection trip. A quick way to invite him is to clip the coupon at the right.

*TRADEMARK OF THE DOW CHEMICAL COMPANY

help you plan and save

. . . with Dow Brush and Weed Killers

THE DOW CHEMICAL COMPANY
AGRICULTURAL CHEMICAL SALES DEPT. 203BA2-9
MIDLAND, MICHIGAN

I'd like a summer check-up of my vegetation control program.

☐ Please have a vegetation control expert call.

☐ Send me free booklet on Vegetation Control for Utilities.

Name_____

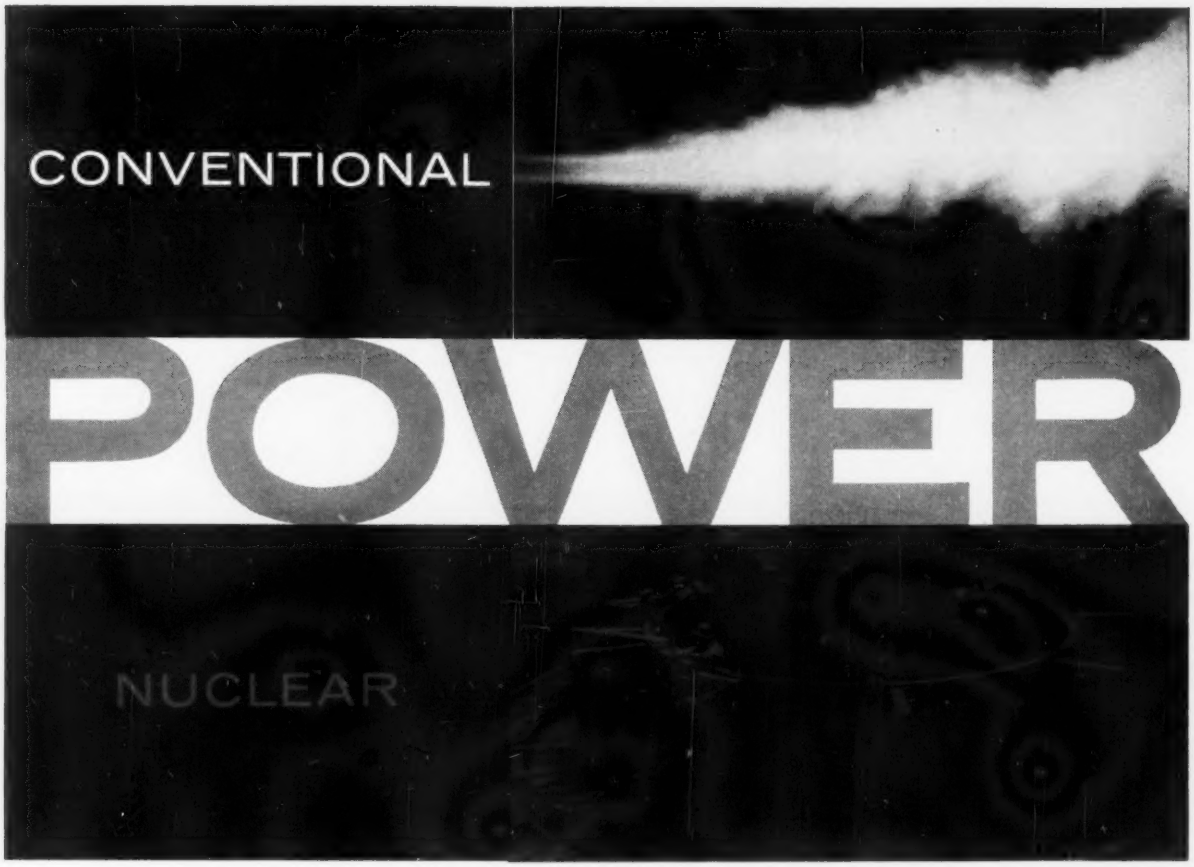
Title_____

Firm_____

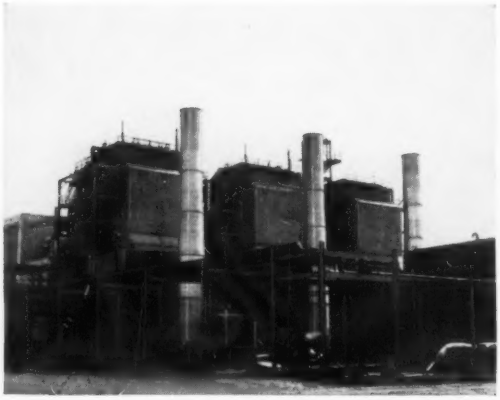
Address_____

City_____ Zone____ State_____

THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN



Kaiser Engineers can design and build your power plant quickly, economically.



960,000 pounds/hour steam generator plant producing process steam, compressed air and 31,250 KW of electricity for alumina plant. Designed and built by KE.

A 475,000 KW power plant in Louisiana. America's Engineering Test Reactor in Idaho. A 100,000 KW industrial steam power plant in Pennsylvania. The engineering study for the AEC's Gas Cooled Graphite Moderated Power Reactor. A $10,000,000 dual-purpose process steam and power plant. New nuclear development projects in Europe, Asia and Latin America. This is Experience—electric power from both nuclear and fossil fuels. To which Kaiser Engineers couples Ingenuity to pioneer, to develop new methods, to achieve efficient plants quickly, at low cost. For experience, ingenuity, and a cost conscious approach, call or write KE. Today.

KAISER ENGINEERS

KAISER ENGINEERS engineers-contractors
Contracting since 1914

Division of Henry J. Kaiser Company • Oakland 12, California • New York, Pittsburgh, Washington, D.C., Buenos Aires, Calcutta, Montreal, Rio de Janeiro, Sydney, Tokyo

"One kind is better..."

A strange-looking phenomenon - - even to most insulator manufacturers!

Unconventional, and highly uncommon laboratory techniques permit study of O-B switch insulator stacks under critical pre-flashover electrical stress. The condition illustrated exists one hundred-millionth of a second before lightning flashover - - that tiny morsel of time in which insulators live or die.

Studies such as this permit us to evaluate the intricate behavior of insulators. It permits us to say in all honesty, "One insulator is better than another." And the reasons why are clearly shown.

When you purchase switchgear or "packaged" substations on the open market, you have free choice of insulators. Isn't it wise to protect the future by taking just a minute to write "O-B insulation" on these orders? Name it, and you can have it!

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass (B)

HOLAN

PORCELAIN INSULATORS · LINE HARDWARE · CAPACITORS · LIGHTNING ARRESTERS
BUSHINGS · HOLAN TRUCK-MOUNTED POWER DEVICES AND BODIES · BRONZE VALVES

4921-H4

All sources of bushing s

strength combined

Result... modern O-B condenser bushings are the strongest we have yet made, after 50 years of satisfactory performance

For nearly 50 years, O-B bushings have proved their strength in rigorous circuit breaker service - - have proved to be of superior strength, in fact.

Conversion to oil-and-paper condenser design within the last few years posed the problem of retaining this superior strength in a much more slender mechanical structure. A new approach was required, and O-B's exceptional core construction supplied the answer.

Tightly compacted under tons of winding pressure, the laminated paper core is "hard and stiff as an oak log." Strength of this massive backbone is exploited by establishing numerous contact points between core and housings, permitting them to work together as a unit, combining their strengths, and ending-up with the strongest bushing we have yet produced.

This is one of scores of ingenious innovations in design you get in modern O-B condenser bushings -- all pointed at maximum dependability.

It is no more difficult to put this dependability to work on your own system than to write "O-B bushings" on your orders for new circuit breakers or transformers.

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass (B)

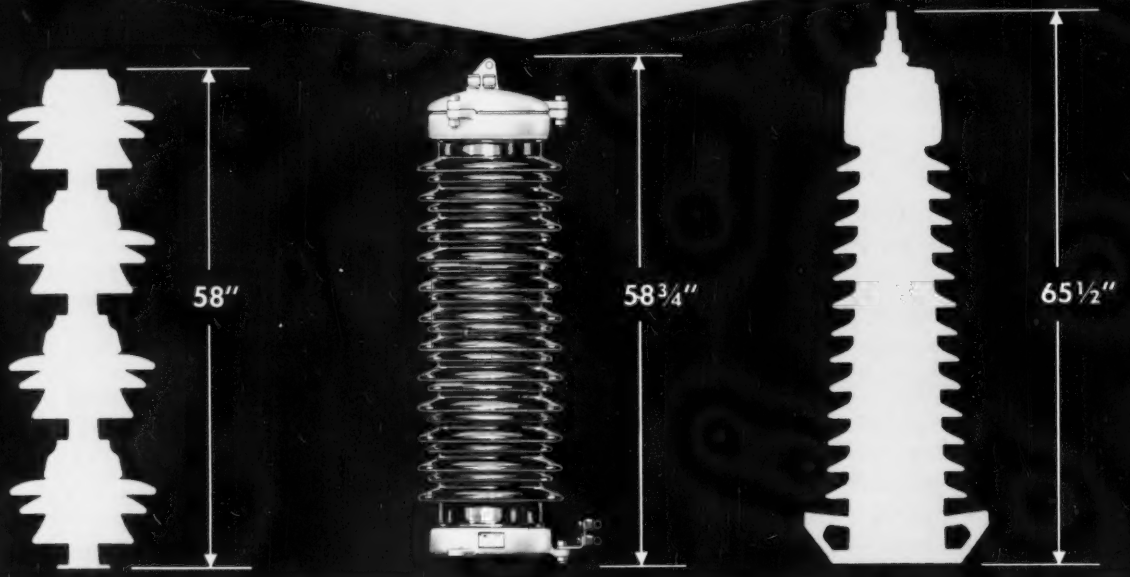
HOLAN

PORCELAIN INSULATORS · LINE HARDWARE · CAPACITORS · LIGHTNING ARRESTERS
BUSHINGS · HOLAN TRUCK-MOUNTED POWER DEVICES AND BODIES · BRONZE VALVES

4921-H23

THOREX® fits anywhere...

Compact Thorex arresters offer a host of opportunities to save trouble and money



Here's food for thought. Look at these dimensions for a Thorex Dynagap Type MPR lightning arrester, an insulator stack, and the upper projection of a bushing, all for 138-kv service. The arrester is about the same size as a bushing or a station insulator.

Think of where you can put these Thorex arresters! Mount them directly on the transformer cover, save the cost of brackets and avoid interference with radiators. Put the arresters right inside station steelwork, anywhere an insulator stack will fit. With Thorex working for you, arresters are no longer a problem of space, special structures, or added costs.

And, for all this convenience and economy, you get single-housing immunity from the effects of contamination, unsurpassed surge durability, maximum protection in every category. This is why Thorex arresters are the unquestioned choice of so many systems today.

OHIO BRASS COMPANY, MANSFIELD, OHIO

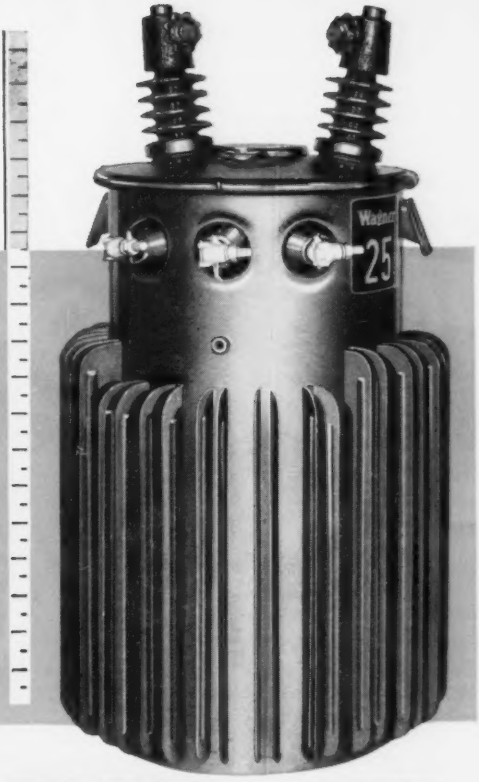
Ohio Brass ®

HOLAN

PORCELAIN INSULATORS · LINE HARDWARE · CAPACITORS · LIGHTNING ARRESTERS
BUSHINGS · HOLAN TRUCK-MOUNTED POWER DEVICES AND BODIES · BRONZE VALVES

4921-H1

You get these *Extra Values* with Wagner Form W Transformers

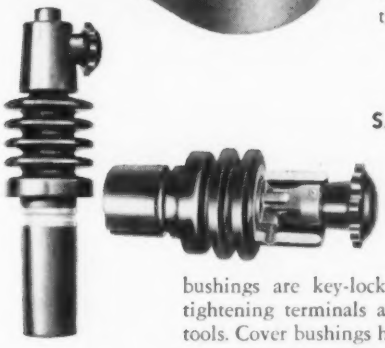


Smaller size than ever before

Wagner's line of single phase pole-type distribution transformers has been redesigned to give you extra value from your transformer investment. One result of this redesign is a substantial reduction in size. The 25 kva Type HEK Transformer, for example, is now only 37 inches high —including the cover mounted bushings!

LOWER EXCITING CURRENT

The improved quality annealed steel core used in these transformers provides a low reluctance path for the magnetic lines of force to result in much lower exciting current. Lower impedance, better ratio of losses, and improved regulation have also been achieved.



SAFETY-KEYED BUSHINGS

Heavy wet process porcelain high voltage bushings are safety-keyed. All terminals are key-locked in the bushing porcelain—sidewall bushings are key-locked in the tank wall. Hand tightening terminals are easily hooked up without tools. Cover bushings have insulated terminal guards to prevent outages caused by birds or animals. All bushing terminals are suitable for use with either aluminum or copper conductor.

LONGER LASTING TANK FINISH

A new formula anti-corrosive paint is hot spray applied on tank sizes below 50 kva—flow coated on larger sizes. A primer coat, intermediate coat and finish coat are each cured by running the tanks through a tunnel of infra-red lamps or through controlled heat chambers. The result is a "Sure Seal" finish that withstands all temperature changes—is much longer lasting in corrosive atmospheres.

The complete line of pole-type transformers, from 3 to 167 kva is available from stock to meet your distribution system requirements.

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

Wagner Electric Corporation

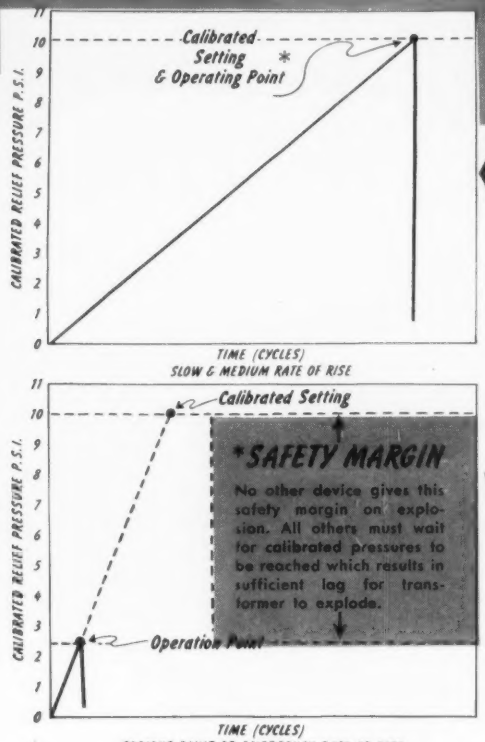
6456 PLYMOUTH AVENUE, ST. LOUIS 14, MISSOURI

SERVING 2 GREAT GROWTH INDUSTRIES . . . ELECTRICAL . . . AUTOMOTIVE

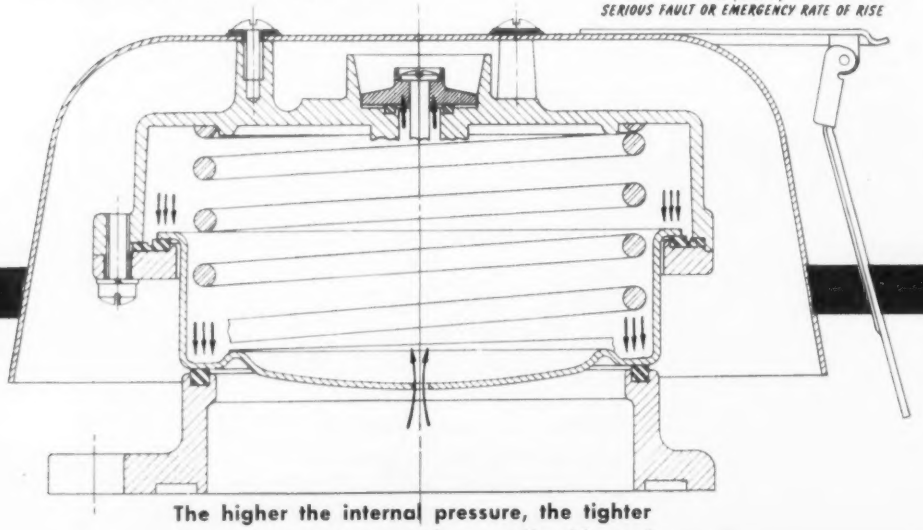
WT59-4

ANNOUNCING after 5 years of

development and exhaustive testing


Calibrated Setting & Operating Point
CALIBRATED RELIEF PRESSURE P.S.I.
TIME (CYCLES)
SLOW & MEDIUM RATE OF RISE
Calibrated Setting
*SAFETY MARGIN
No other device gives this safety margin on explosion. All others must wait for calibrated pressures to be reached which results in sufficient lag for transformer to explode.
Operation Point
CALIBRATED RELIEF PRESSURE P.S.I.
TIME (CYCLES)
SERIOUS FAULT OR EMERGENCY RATE OF RISE

No Failures – Completely reclosed and resealed each time within 5 cycles.



The higher the internal pressure, the tighter the seal against atmosphere until calibrated pressure is reached.

Write for demonstration appointment

Qualitrol's pressure anticipating RELIEF DEVICE for TRANSFORMERS

that can think for itself!

1. Releases at calibrated pressure on any slow to medium rate of pressure rise. Can be easily calibrated at any desired pressure.

2. On Serious Fault disregards calibrated setting and blows at 2½ psi.

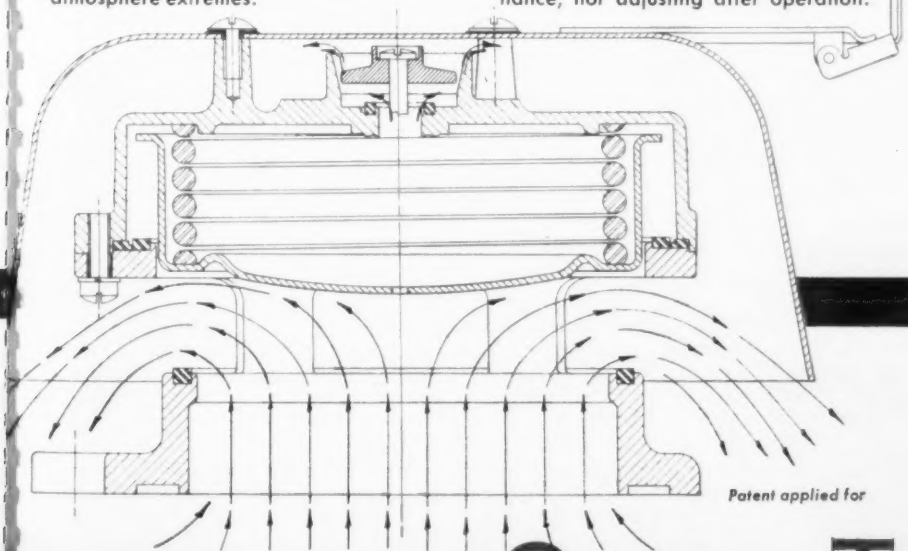
MEANS GREATER PROTECTION

Completely automatic, it decides for itself when emergency operation is necessary. Recloses and reseals itself each time.

3. Completely opens within ½ cycle—

OTHER SAFETY FEATURES

1. Positively no leaks—on slowly rising pressures or vacuums, *seals more tightly against atmosphere.*
2. Only one moving part.
3. No parts extend into transformer.
4. No external moving valve parts.
5. No obstruction to free flow of gases to atmosphere.
6. Operates under all temperature and atmosphere extremes.
7. Mechanical signal flag gives visual signal alarm.
8. Available with switch to give electrical remote alarm.
9. May be readily locked out of service, for testing transformer above calibrated relief setting.
10. Completely automatic . . . no maintenance, nor adjusting after operation.



Patent applied for

When calibrated pressure is reached or fault occurs, device completely opens within only ½ cycle.

Thousands of tests have been completed. Comparative tests prove this device out performs all others. Here are

A FEW TESTS PERFORMED

1. Operated every 15 seconds at 10 psi (rate of rise 10 psi in 15 sec.) continuously for 24,000 operations. Reseal each time.

2. Operated at special release pressure at 50 psi (rate of rise, 50 psi in 3 minutes)—for 250 times. No failure, no leakage, no physical damage.

3. High Pressure Test (instantaneous)—Air released "*instantaneously*" by means of special valve (designed for this test) at pressures of 25, 50, 75 & 125 psi. No physical damage, no leakage, no failure.

4. Tested repeatedly on high voltage—Mounted on oil filled tank simulating transformer application. Arc introduced under oil to cause explosion.

A. 10,000 volts . . 8,000 amps
B. 20,000 volts . 16,000 amps
C. 20,000 volts . 25,000 amps

No Failure — Completely Reclosed and Resealed Each Time

Let us demonstrate this unit in your plant—show movies of tests performed under actual conditions in the high voltage laboratory. Write for demonstration appointment.

QUALITROL CORP.

Pressure System Devices Division

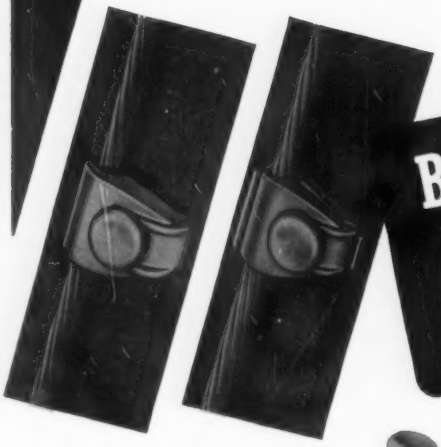
East Rochester, N. Y.

YOU GET

LONG-LASTING PROTECTION FOR YOUR OVERHEAD SYSTEM

with

BLACKBURN *Grounding* DEVICES



Type GTC 1
One plate tower ground clamp

Type GTC 2
Two plate tower ground clamp

Steel Driving Stud
for Sectional Ground Rods

Copper Alloy Coupling
for Sectional Ground Rods

Copper Bonded Sectional Ground Rods

Copper Bonded Regular Ground Rods

Copper Bonded Pigtail

Type GUV
U-bolt ground clamp parallel or 90°

Type GG
Ground Rod Clamp
Socket set screw

Type GGH
Ground Rod Clamp
Square head bolt

Type B
Budget Line Ground Rod Clamp
Square head bolt

Type GP 100
Electrolytic Copper Pole Bottom Plates
7½", 10", 14" dia.

Blackburn grounding devices will save you thousands of dollars annually in preventing burnouts of expensive overhead equipment. This complete line simplifies your stocking problem—one source for all your needs. Like all BLACKBURN products they are constructed of high-strength corrosion resistant materials—designed for easy installation and engineered for long-lasting, trouble-free grounding. Always specify BLACKBURN.

Available Through Electrical Wholesalers Everywhere

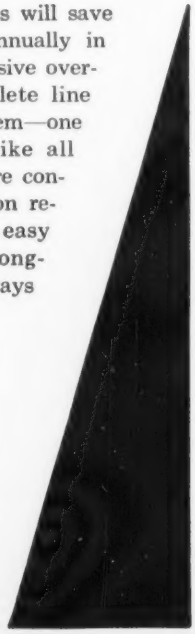
DISTRIBUTED ON THE WEST COAST BY

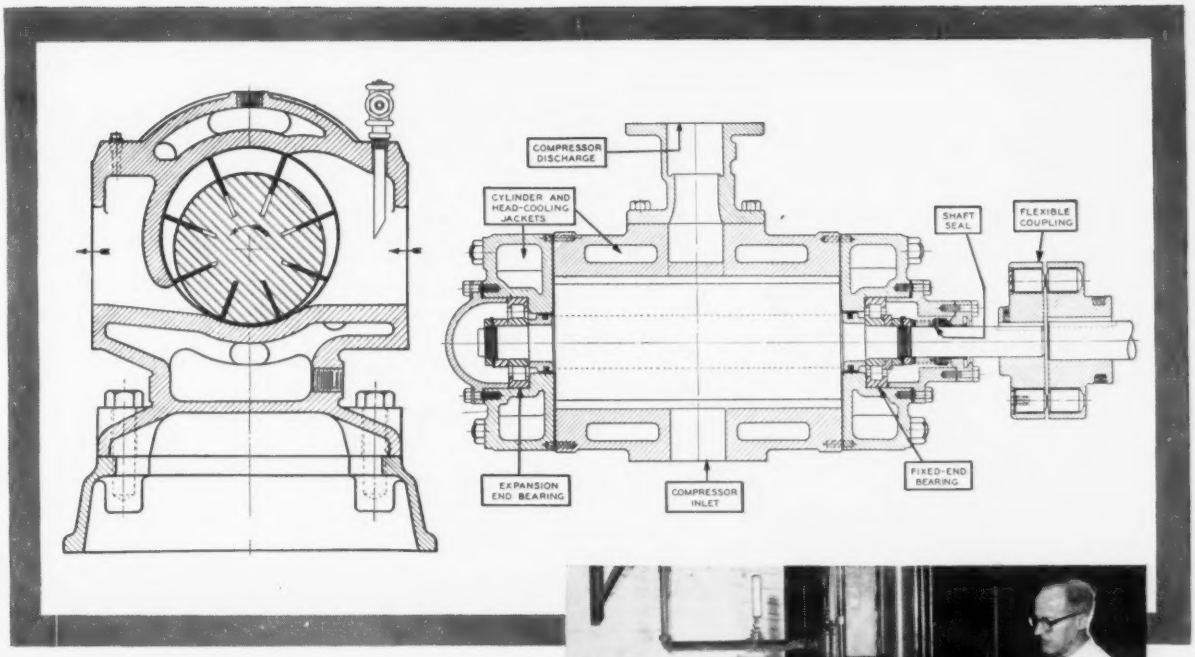
KORTICK MFG. CO.

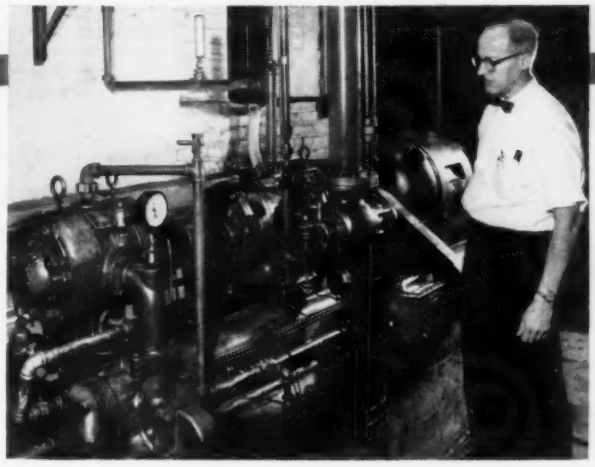
JASPER BLACKBURN CORPORATION

ST. LOUIS 14, MO., WYdown 3-9430

1525 WOODSON RD.







Hard service never affected this Fuller rotary's original output—230 cfm. of air at 90 lb. G., reports Mr. Schott, chief engineer, Thomas C.Wilson, Inc., Long Island City, N.Y.

FULLER ROTARY COMPRESSOR RUNS 13 YEARS WITHOUT DOWNTIME

A Fuller rotary at Thomas C. Wilson, Inc. got its first maintenance shutdown recently, for renewal of roller bearings and rotor vanes—after running without downtime since 1945.

4 years of 24-hour service. The Wilson plant makes tube cleaning equipment, tube expanders and portable pneumatic tools, and so makes heavy daily demands on shop air. For the first four years, three-shift operation kept the Fuller rotary running round the clock. Since 1949, it's been working eight-hour shifts.

Simple design means trouble-free service. Besides bearings, the only moving parts in a Fuller vane-type rotary compressor are the cylinderical rotor and the blades. These compensate for wear automatically. Cylinder head slips off, permitting blade and bearing inspection in a matter of minutes.

Compact and vibration-free. Direct-drive system saves space. Simple, rugged design gives constant service without extensive supervision. Thus, Fuller rotaries can be installed out-of-the-way—on upper floor, on balconies, in basement corners, using low-cost, light-weight foundations.

1189
C-340

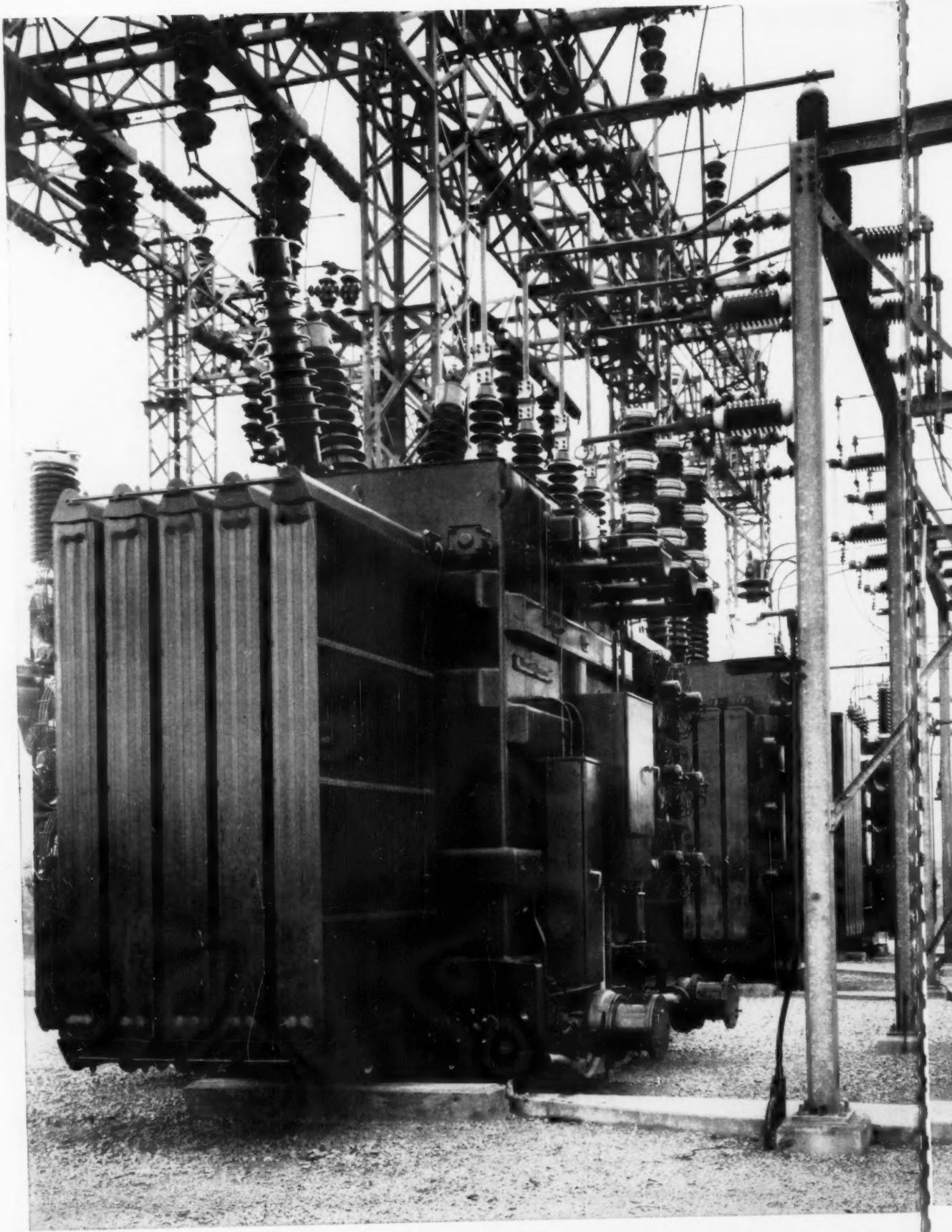
Write today for detailed information on the full line of Fuller rotary compressors for in-plant services, gas gathering, and industrial refrigeration.

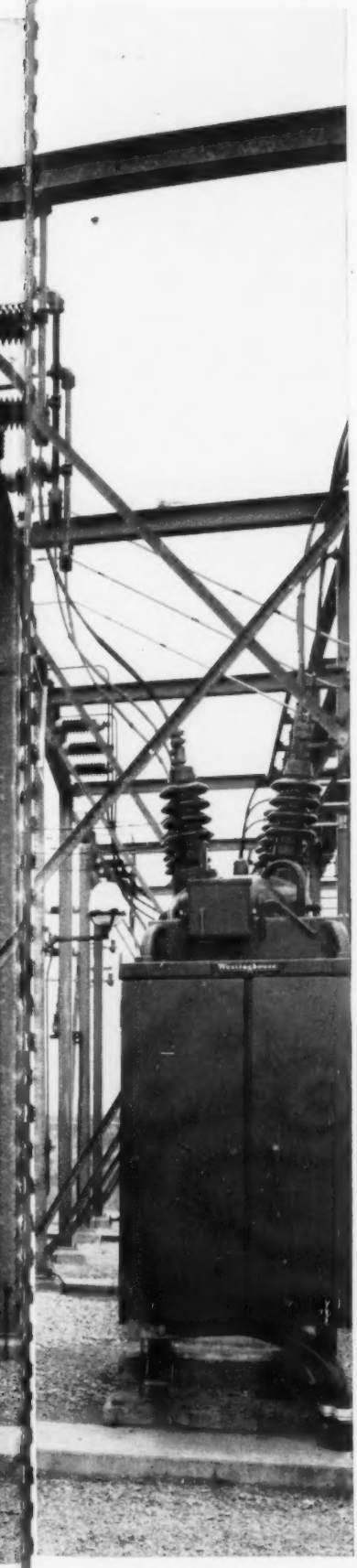
FULLER COMPANY
GENERAL AMERICAN
TRADE MARK

FULLER COMPANY
172 Bridge St., Catasauqua, Pa.
SUBSIDIARY OF GENERAL AMERICAN TRANSPORTATION CORPORATION
Birmingham • Chicago • Kansas City • Los Angeles • New York • San Francisco • Seattle

Fuller
....pioneers in harnessing AIR

PIONEERS OF HIGH-EFFICIENCY VANE TYPE ROTARY COMPRESSORS SINCE 1930





Bonus Value Beyond the Specification...

HIGHEST KVA PER POUND

New Westinghouse Inner-Cooled Transformer Construction Also Cuts Installation Space and Cost

New York State Electric & Gas Corporation recently installed the world's first transformer with Inner-Cooled construction. Developed by Westinghouse, Inner Cooling makes possible drastic size and weight reductions; in this instance, weight per kva of the 30,000/40,000/50,000-kva transformer has been reduced from 3.5 to 3.1 pounds per kva; and on the higher voltage, higher kva units, the weight per kva has been reduced to as low as 1 pound per kva.

In addition to the installation savings made possible by major space and weight reductions, Inner Cooling also promises operating savings through lower impedances and improved performance. And by crashing the size barrier, Inner-Cooled construction makes it possible now to build and ship transformers with ratings up to 600,000 kva or more . . . to meet all demands of the foreseeable future.

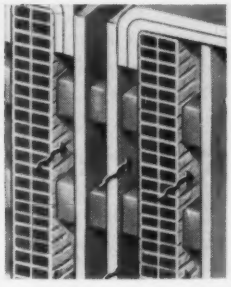
Ask your Westinghouse representative for the full story on the new Inner-Cooled construction—another "Bonus Beyond the Specification" made possible through Plowback of Earnings into transformer research and development.

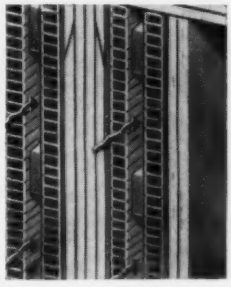
J-70829

YOU CAN BE SURE...IF IT'S Westinghouse

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV MONDAYS

WORLD'S FIRST Inner-Cooled transformer (at left) is installed on the system of New York State Electric & Gas. Located at Hinman Road Substation, Lockport, New York, this Westinghouse power transformer is rated at 30,000/40,000/50,000-kva, OA/FOA/FOA. The Inner-Cooled transformer is installed in the same space as that of previously installed 15,000/20,000/25,000-kva transformer in the background.





Ordinary transformer construction (left) places the oil ducts on both sides of the coil consisting of multiple conductors wound in parallel. Inner Cooling (right) positions the oil ducts between the parallel-wound conductors, with cellulose material between adjacent coils. This utilizes fully both the dielectric and mechanical strengths of conventional transformer materials.

OTHER WESTINGHOUSE POWER TRANSFORMER BONUS VALUES

Insuldur* Insulation System—"Form-Fit" Construction—Vapor/gas Cooling—Reduced Sound Levels

*Trade-Mark

resists water...like KERITE INSULATION

It's the **KERITE** *that makes the difference*

KERITE CABLE

30 Church Street, New York 7.
Branches in Ardmore, Pa., Boston, Cleveland, Chicago, Houston, St. Louis, San Francisco, Glendale, Cal.

FEBRUARY 9, 1959

Pearl Street Station Site 1959

Many monuments stand today to honor Thomas Alva Edison whose birthday we observe on February 11 as part of National Electrical Week. Not the least of the monuments is the living industry he helped create.

Today the site of Edison's pioneer central station and the cradle of our industry is marked by a 42-year-old bronze plaque on the wall of a loft building that houses a sanitary supply house at 257 Pearl Street on New York's lower east side.

Here, where crowds cheered the first glow from 800 incandescent lamps on the evening of September 4, 1882, flapping paper signs now advertise rock salt, snow shovels, and cocoa mats. The shoddy surroundings clash harshly with the proud words on the plaque:

> *In a building on this site an Edison electric plant supplying the first Edison underground central station system in this country, and forming the origin of New York's present electric system, began operation on September 4, 1882 according to plans conceived and executed by THOMAS ALVA EDISON.*

This week . . . National Electrical Week, 1959 . . . the electrical organizations everywhere are dramatizing the vital role of the electrical industry as job builder and bulwark of the nation's economy and progress under the theme "Electricity Builds Jobs." As an employer the industry distributes its $13¾ billion payroll among more than 3 million people—one out of 20 people working today. Countless millions more are being reminded this week of how their work is lightened, their income bolstered, and their life brightened by the industry, born on this site.

Electrical Week, falling each year at the time of Thomas Edison's birthday, is fitting recognition of the benefits to mankind of all our great pioneers. It would be fitting, too, if the birthplace of our great industry could be more appropriately dignified.

NATIONAL ELECTRICAL WEEK
FEB. 8-14, 1959

N.E.W. Promotions Focus on Electricity's Benefits to Nation

The theme of this year's National Electrical Week — "Electricity Builds Jobs"—highlights the electric industry's contributions to increased employment and to the social and economic progress of the nation. It is being celebrated this week, Feb. 8-14.

Some 160 manufacturing and utility companies in the U. S. and Canada are staging N.E.W. celebrations, according to N. J. MacDonald, president of Thomas & Betts Co and chairman of National Electrical Week committee. Here's a rundown on the activities of several utilities around the country:

New West Penn All-Electric Rate

• West Penn Power Co is observing National Electrical Week by announcing a new all-electric rate and launching the company's first system-wide electric heating promotion. It is also plugging N.E.W. in West Penn News, the company's employee magazine.

• Cincinnati G&E, as in past years, is using the Cincinnati Electrical Exposition as a vehicle for National Electrical Week. Called the "Electric Living Exposition of 1959," it is sponsored by Cincinnati Electrical Assn, of which CG&E is a prime mover. This year's exposition is built around the theme, "Electricity . . . Your Magic Carpet to Comfort." Suspended at one end of the Cincinnati Gardens will be a colorful Arabian Night's magic carpet balloon on which several figures will be "riding in comfort." At the other end of the Gardens a cave, set against a background of old Bagdad, is flanked by two massive doors. These doors will be the "Open Sesame" to appliance prizes, to be won by visitors. Another Cincinnati highlight: A 50-million-candlepower photo flashtube, mounted on top the Gardens, and flashing every two seconds during each night of National Electrical Week.

N.E.W. CHAIRMAN MACDONALD says 160 manufacturers and utilities are observing National Electrical Week

• Southern California Edison is taking the civic approach to N.E.W. First, the company prepared a suggested mayor's proclamation which its district managers presented to the mayors in their communities for signature. The proclamation was accompanied with a news story for local papers. Second, So Cal Ed made up a pattern speech, suitable for presentation before service and civic groups by district managers. Third, a feature N.E.W. story went to all area papers at the beginning of the week.

• Union Electric, whose Merrill Skinner was the originator of the Week, is observing it jointly with the St. Louis Board of Trade with a luncheon for some 600 important community people. Both the governor and the mayor have issued proclamations.

Dedicates New Service Center

• Public Service of Colorado also obtained proclamations by the governor, the mayors of Denver and other smaller towns. Heading up PS of Colorado's celebration will be the dedication of a new service center near Denver.

• Detroit Edison, in addition to newspaper releases and radio and TV spots, is setting aside two days for young peoples' visits through its power plants. On Wednesday, leading high school students will visit the Enrico Fermi A-plant, then go to Edison's laboratory at Greenfield Village, and finally to lunch at the Ford Museum.

• New England Electric System is making its N.E.W. pitch primarily through TV. In addition to distributing to the TV stations a considerable amount of Reddy Kilowatt material, NEES is also sending them the films of the latest construction at Yankee Atomic Electric plant.

• Gulf States Utilities is relying mostly on newspapers. Its publicity department prepared more then 300 column inches of material for local papers. GSU also scheduled a Beaumont mayor's proclamation; an election of Miss National Electrical Week; the putting on the line of its new 111,000-kw unit at the Neches Station; and a new street lighting job in Beaumont.

Manufacturers Join In

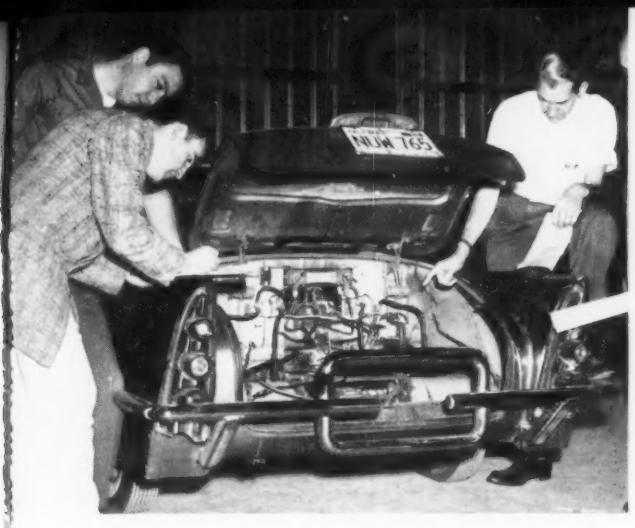
Manufacturers join in observing National Electrical Week. For example:

• Allis-Chalmers is running color N.E.W. ads in Time, U. S. News & World Report, Newsweek, Business Week, Fortune and The Wall Street Journal. It is also using the N.E.W. emblem (see above) in its company publications.

• Thomas & Betts' MacDonald made a national address on National Electrical Week last Saturday, Feb. 7. His company will also sponsor a Science Youth Day. It plans to use N.E.W. to kickoff a full year of activities to better inform its employees of electricity's benefits.

• General Electric featured N.E.W. in its Feb. 8th GE Theater on national TV. This is being backed by local promotions, plus presentations to local officials of Edison lamp replicas.

• Westinghouse will run N.E.W. tie-in ads in national magazines. It will also tie-in the commercials on its Desilu theatre, as well as promote National Electrical Week over the Westinghouse Broadcasting Co network.



Interest continues to mount . . .

in Stinson's sports model as . . .

The 'Electric's' Nearly Over the Hump

Despite a few snags, the first electric sports cars will come off the assembly line of Stinson Aircraft Tool & Engineering Corp's San Diego plant within a few weeks.

Dean Van Noy, Stinson president, said the firm had 47 firm orders, two weeks ago, most of them from electric utility companies. The first model will be delivered to Atlantic City Electric Co about a month after it comes off the assembly line.

"We want to test this car completely so it will give the finest performance," Van Noy said.

Difficulties in making plastic body molds slowed production by about two weeks, but these problems have been overcome, he said. Instead of selenium batteries, Stinson will install conventional lead-acid types which Exide will supply for the first models.

Cost to Utilities: $2,200

The sports cars—called Charles Town-Abouts—ordered by utilities will cost $2,200, he said. This is about $500 lower than the retail price on '59 models. "We're giving utilities a special price because of their help in promoting and developing the car," Van Noy said. "Their engineers and maintenance men will give us monthly reports on the car's performance."

With mass production, Stinson feels the retail price can be cut to $2,000 or less.

Meanwhile, in Ft. Lauderdale, Fla., H. Drake Harkins, director of Atlantic City Electric Co, said "I'm optimistic on the San Diego developments." The retired DuPont engineer began promoting interest in an electric automobile about two years ago after watching Ft. Lauderdale housewives buying or renting electric golf carts for shopping trips.

Harkins visited the Stinson plant at the first of the year. His report to Atlantic City Electric urged "fullest support" for the project.

ACE has calculated that the first model will use from 21.3 to 26.7 kwhr for a full charge, depending on the amperage rating of the battery charger. Based on the utility's bottom-step rate of 1¾¢ per kwhr for everything over 300 kwhr, a customer's cost then would be from 37 to 48¢. Improvements in battery chargers could cut these costs somewhat, however.

HARKINS: 'I'm optimistic'

Charge Takes About 11 Hours

The built-in battery charger is offered as optional equipment on the Town-About. Car owners can simply plug in the charger to a 115 v outlet. Charger input is at 20 amp. ACE estimates battery charging at a constant rate would take about 11.6 hr. This would supply a full charge for the car's 77-mi driving range.

Speed of the Town-About will be about 60 mph. The car is 164-in. long, holds three passengers.

E. L. Gerber, ACE's manager of development, has filled a file drawer with suggestions, comments, inquiries and findings that have flowed in since the utility acted on Harkins' groundwork. Electrical equipment manufacturers, battery makers, coal companies, and a few of the smaller auto producers have expressed interest.

Still indefinite is a plan to drive the first Stinson model cross country to New Jersey. The run would break a 25-yr-old distance record for U. S. electric cars. Exide has offered to supply a truck filled with spare batteries for the trip.

Automatic Meter Reading's a Step Nearer

New York inventor awarded patent for system that uses telephone lines. Individual readings would take 10 sec

The accompanying patent drawing depicts the meter reading system of the future, as envisioned by a Binghamton, N. Y., inventor. Curtis M. Cooper, former repairman for the New York Telephone Co, believes the system provides the long-sought answer to utility questions on automatic meter reading.

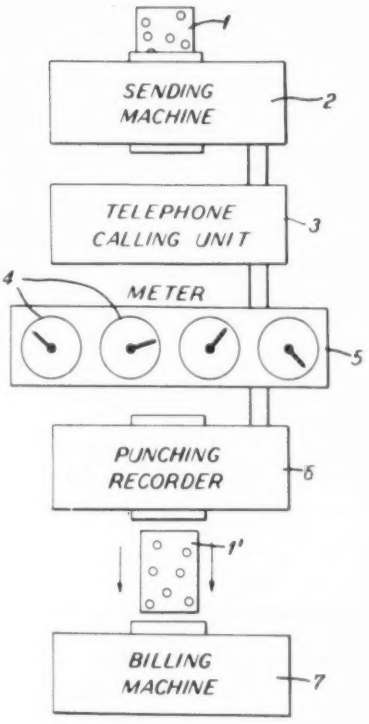
Cooper developed the system from an idea conceived by his uncle, W. Arthur Sprague, head of New York State Electric & Gas Corp's general accounting department.

Telephone lines would be used for the automatic readings in a way "that would meet all of the telephone company's requirements electrically and, with their high standard of public relations, no invasion of privacy nor annoyance," Cooper told EW.

A good deal of work remains before the system is feasible, the power company said. This includes the sanction of the state's regulatory commission, assistance of meter manufacturers, authorization by the phone company, and testing.

In about a 10-sec cycle, the setup would find punch cards being fed to a sensing machine which energizes the circuits of a telephone call transmitting unit. If the line is clear, the transmitting unit energizes reading elements on the meter. These elements send back successive short electrical impulses to the punching recorders of the step-by-step type. The recorders punch the meter reading on the customer's billing card, then the mechanism is cleared for the next customer.

Cooper says the meter scanning unit is easily adaptable to the present meter. Patent is No. 2,870,258.



Three Rate Decisions Set Some New Precedents

Three important rate cases have been decided by commissions.

The first is an order with no precedent in regulatory history. Maine Public Utilities Commission ordered Bangor Hydro-Electric Co to take liberalized depreciation, even if the company preferred not to.

Bangor, which had used straight line depreciation during the test period, said if it were not permitted to normalize taxes its financial position would be injured as follows:

1. It would be unable to compete with companies more favorably placed for funds in the capital market.

2. It would discriminate in favor of present customers.

Commission witnesses said the company had a duty to use actual taxes in order to minimize expense; that the deferral was in reality a permanent reduction of taxes.

Commissioner Frederick N. Allen in his dissent said: "For a regulatory body to force this upon Bangor Hydro-Electric Co by mandate, either by direction or indirection, is contrary to the inherent rights of management and beyond the legal scope of this commission."

Bangor indicated it is going to ask for a rehearing of the order, which authorized a rate increase of $365,385 a year.

Fair Value Base Used

In the second order, Iowa-Illinois Gas & Electric Co had asked the Illinois Commerce Commission for 6.8% increase from its Illinois electric operations. ICC pegged original cost of the property at $31,930,000, and the net original cost rate base—including construction work in progress and working capital—at $26,555,000. Reproduction cost new, less depreciation rate base, was found to be $46,092,000. A fair value rate base of $31.6 million, and a fair rate of return on that rate base of 5.85%, was set by ICC.

The book original cost of the property and the fair value rate base found by ICC are nearly identical. Also, the fair value rate base is some 19% in excess of the net original cost, giving an effective rate of return of some 6.95% on net original cost.

As for treatment of liberalized depreciation, the order does not indicate that normalized taxes were disallowed or the tax reserve was deducted from the rate base.

The third order was received by Black Hills Power & Light Co. Wyoming Public Service Commission used the company's system-wide earnings in setting the rate of return rather than separating the Wyoming and South Dakota property. It said that this would benefit Wyoming customers because of load concentration in South Dakota.

It upheld the company in its normalization of taxes, saying it had a previous case where tax deferrals were viewed as a liability.

Anderson Calls for Truce on Atomic Power

Chief of Joint Congressional Committee is amenable to the Ad Hoc group's recommendation for small prototype reactors

Sen Clinton Anderson (D-N.M.) says it's time to call a truce in the public-vs-private power controversy as it applies to the atom—and he is willing to forego the idea of large-scale federal reactors to help bring it about.

The chairman of the Joint Congressional Committee on Atomic Energy told newsmen a week ago that "I am determined that a concrete, understandable program for ensuring that this country takes its proper place in the development . . . of atomic energy for power shall be enacted in this Congress."

Ad Hoc Report Is "Fine"

He calls the report of the Ad Hoc AEC-Industry Advisory Committee (EW, Jan. 19, 1959, p 30) a "fine document—a good document," despite a few points of difference with his own views. And he described his relations with AEC Chairman John McCone as excellent—a far cry from his bitter, running feud with ex-chairman Lewis Strauss.

Anderson, who as chairman will probably call the signals on atomic power legislation this year, says the public-vs-private power controversy has held atomic development back.

If more headway can be made by building prototype reactors of a size that doesn't worry private power interests so much, he indicated he's willing to try it. He offered the view that prototypes up to 100,000 kw would probably get the job done.

The New Mexico Democrat believes such prototypes should be built by the government at AEC sites with all the power used by the government. However, he would leave the door open for some private participation in the prototypes.

He agrees later generations should be built by private enterprise with government assistance.

This moves Anderson close to the views held by AEC and its Ad Hoc Advisory Committee.

The key Democrat also made it clear he won't stand in the way of narrowing the number of reactor concepts pursued by the commission —if this will ease the way for agreement on a long-range program "which will get reactors built."

Despite the bouquets being tossed by Anderson, however, two clouds on the horizon spelled possible trouble, and a renewed outbreak of hostility between the Joint Committee and the Administration:

- AEC's reactor development division is known to have recommended that the commission go forward with construction of the Kaiser-ACF design for a gas-cooled reactor, leaving the Philadelphia Electric group's "partnership" proposal up in the air until additional legislative authorization is obtained. There is speculation the commissioners will buy this view.

However, Joint Committee sources hear the commission may propose that the Kaiser-ACF reactor be built without power-producing facilities—an idea likely to raise the ire of Congressional Democrats.

- It remains to be seen whether AEC's supplementary construction budget—to be submitted several weeks from now—will include funds for construction starts on prototype reactors. AEC Chairman McCone reportedly was vague on this point in a recent appearance before the committee.

Both these points will be aired when the Joint Committee opens hearings Feb. 17 on the growth and development of the atomic industry.

Aggressive Reactor Development Urged

"We are within sight of economically useful power reactors if we follow straight-forward and aggressive development along lines already laid out," said W. Kenneth Davis, Bechtel Corp, at the First International Symposium on Nuclear Fuel Elements late last month in New York.

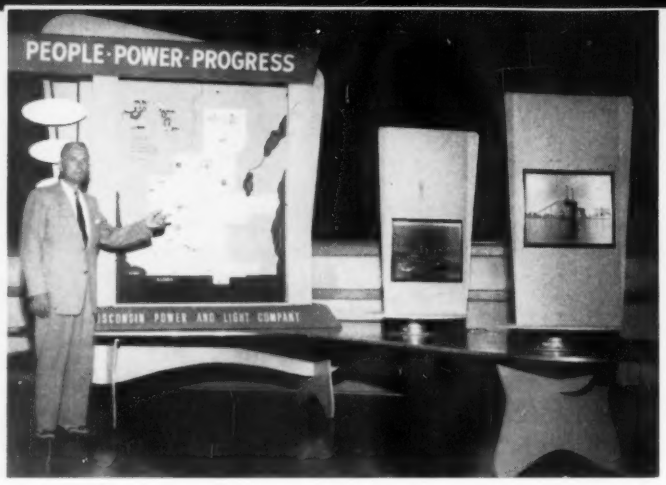
Goal Requires Capital Cost Cut

The immediate problem, observed Davis, is how to make nuclear power plants economically competitive with conventionally fired plants in high-fuel-cost areas of the United States within 10 years. He suggested this goal will require cutting capital costs to $225 or $250 per kw and fuel to 2 or 2.5 mills per kwhr. Recent progress permits building nuclear plants today to produce power for about 50% more. Prospects are bright for achieving economical power relatively soon with "a sufficiently aggressive and intelligent program," he said.

Capital and fuel costs must be cut, Davis observed, implying that capital savings are more urgently needed now. It appears highly desirable to push development of the boiling water, organic cooled, and high-temperature gas-cooled reactors to "a sound base" without interference from more advanced types. The latter should also be developed, but Davis said he saw "no apparent advantage to use of heavy water."

Key to reducing high fuel-element costs lies in boosting the volume of production to serve 10 to 20 similar reactors. He proposed that utilities anticipate more reasonable future costs in projecting their plans for nuclear power plants, and implement this reduction by concentrating on similar fuel elements to gain the economies of larger-scale production.

Many reactor cores appear to have extravagant safety factors, Davis added. The balance of the power plant should be designed for a considerably higher ultimate output, he suggested. Adequate instrumentation should be included to verify the original design, utilize design margins, and develop data for future improvements.



WP&L PRESIDENT C. J. Forsberg shows a map of company operating area at recent stockholder meeting. At right, WP&L Vice President C. C. Herrmann, second from left, discusses company operations with interested stockholders

Wisconsin P&L Holds a Series of

Wisconsin Power & Light Co has set a pattern for making friends with its stockholders which will be hard to beat. The WP&L "get acquainted" program included 16 meetings attended by some 6,000 stockholders in Wisconsin. Here's the way it worked:

Meetings were held in each of the company's 13 operating districts. In addition, two were held in Milwaukee (necessary in order to accommodate the huge turnout) and one in Madison.

All meetings were attended by President C. J. Forsberg, three vice presidents, and the district executives of the district in which each particular meeting was being held. Company officers greeted stockholders and shook hands with them —a highlight of the meetings.

Response 'Tremendous'

Response to the entire series of meetings has been tremendous, according to Forsberg. He said that while there was a lot of work involved in putting on such a series of meetings—sometimes as many as three a week—the results were rewarding and gratifying. Furthermore, the meetings proved as beneficial to company executives and personnel as they did to the stockholders.

One particularly pleasing aspect of the meetings was the universally favorable attitudes of stockholders toward the company, its management and policies, as reflected in their questions at the end of each meeting. At no time were there any questions of a critical nature. Mostly the stockholders were seeking information about the company, its methods of operation, its prospects and its problems. Many even wanted to know what they could do for the company to help it. Although WP&L executives had anticipated questions about increasing dividends, none were raised.

Preparation Was Elaborate

Preparation for the meetings was, of course, elaborate. First of all, letters went out over President Forsberg's signature inviting stockholders. Two reply cards were enclosed, one for the stockholder, a second as an extra that he or she might use to bring a guest. Acceptances far exceeded expectations; in many cases it was necessary to provide additional facilities to handle the crowds.

Material for the meetings was carefully prepared. A thorough search was made for information that would be of interest to stockholders; then this material was carefully organized for effective presentation. (See charts at bottom of next page.)

Despite this elaborate preparation, some attempt was made to give the meetings an informal, spontaneous atmosphere (see illustration). No one spoke from notes or used fully prepared texts. As the meetings progressed, the officers' presentations got better and better.

District Manager in on the Act

As to the meetings themselves, they were opened by the district manager. After a few remarks, he introduced Forsberg, who acted as master of ceremonies for the rest of the meeting, introducing the vice presidents in turn for their respective talks.

Forsberg himself discussed the Internal Revenue Service ruling on the disallowance of certain advertising expenditures for tax purposes, and the importance of the ruling to stockholders. He then talked a bit about nuclear power—a subject which invariably invokes the interest of laymen—the status of A-power development, and WP&L's participations in such programs.

J. E. Canfield, vice president, district operations and sales, told stockholders about the area served by WP&L, the types of service rendered, and the rapidly growing use of electricity by the company's customers—with its attending expanding revenues.

He also sketched the meaning of industrial development for the WP&L area, in terms of immediate industrial revenue, plus those commercial and residential revenues

INFORMALITY marked the series of WP&L stockholder meetings. L to r, J. E. Canfield and J. D. Howard, vps, Forsberg, H. W. Wright, district manager and vp C. C. Herrmann. At right, stockholders chat on post-meeting refreshment line

f 'Hard to Beat' Stockholder Meetings

which new industry, by bringing in new money and people, help provide. He did not let the subject of electric heating go unmentioned: "With Wisconsin Power & Light's rates, electric house heating is practical in properly insulated homes."

Canfield also told the stockholders that there is reason to believe that future growth for WP&L will be as fast or faster than in the past.

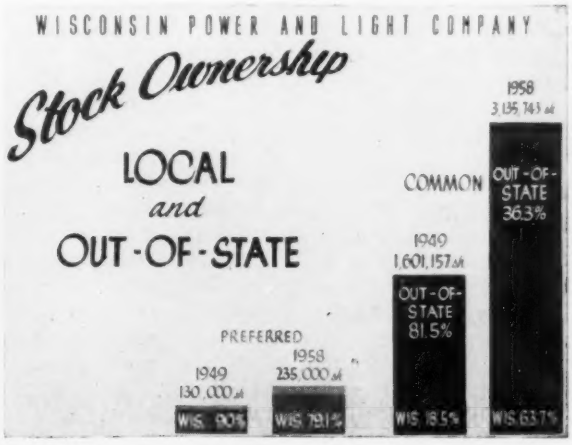
J. D. Howard, vice president in charge of engineering, system operations and maintenance, told stockholders of the advance planning and construction schedules necessary to keep abreast of the load growth reported by Canfield. He discussed the problem of having power available when needed, when three to four years are required for designing and building additional capacity. He also made a slide presentation showing turbine generators and other power plant equipment, transmission and distribution facilities, and discussed the part each plays in the over-all operation of the system.

C. C. Herrmann, vice president of accounts and finance, talked finanical matters over with stockholders. He covered investment, operating expenses, revenues, dividends, capitalization ratios and taxes and wages.

Following the formal presentations by each officer was a question-and-answer period of about 30 minutes' duration.

Refreshments followed each meeting. This afforded a further opportunity for stockholders and officers to get better acquainted.

The stockholder meetings, in effect, were a one-evening short course on the company. They were well received, were enlightening for both stockholders and officers, and were generally felt to be worth the time and effort they required.



PRESENTATIONS to stockholders included such information as total amount paid to investors, employees and government, 1948-1957; and Wisconsin P&L stock ownership, both local and out-of-state, for the years 1949 and 1958

SEC Proposes Change in Accounting Procedure

Debate is under way on plan to adopt accounting procedures like the recent FPC ruling on amortization and depreciation

Securities & Exchange Commission is stirring up a big debate over accounting procedures used to prepare financial statements submitted to it. The issue is how companies are to treat credits equal to the temporary reductions in federal taxes resulting from liberalized depreciation (Section 167) and accelerated amortization (Section 168 of the Internal Revenue Code of 1954).

Under a SEC proposal, any financial statement which designates as "earned surplus" or includes as a part of "equity capital" the accumulated credits arising from the temporary reductions in income taxes because of the use of the above sections for depreciation and amortization will be considered "misleading or inaccurate."

Reserve Account Preferred

SEC wants an amount equal to the tax deferral charged to current income on the financial statement. With a concurrent credit made to a separate balance sheet account—such as "reserves: deferred federal income taxes."

SEC thus is attempting to bring its accounting procedures into line with those recently adopted by the Federal Power Commission on the same subject. SEC's basic position boils down to this:

It just is not good accounting practice to charge deferred federal income taxes as an operating expense item and at the same time show it on the balance sheet as "earned surplus" even if it's restricted as to the payment of dividends.

Here's the SEC reasoning behind the proposal: under both Sections 167 and 168, companies are permitted to make a faster tax-free recovery of capital invested in plant than previously allowed for income tax purposes.

As a result, current taxes are temporarily reduced in the early years because of bigger depreciation allowance. But in future years, this procedure will result in reduced depreciation deductions for tax purposes, with a resulting increase in income taxes over the amount of taxes which would otherwise be payable.

This creates a problem where companies deduct liberalized depreciation or accelerated amortization for tax purposes—but deduct only normal depreciation on its books of account. SEC has correctly taken the realistic position that taxes are merely deferred and that consequently since a future liability is created provision must be made for the ultimate extinction of this liability. This is in direct opposition to the views held in Maine, Pennsylvania, and elsewhere.

The only way to avoid this, says SEC, is to charge current income with an amount equal to the tax reduction. The credit would be accumulated in a balance sheet account—separate from earned surplus or equity capital—and would be returned to income proportionately in later years when the depreciation then allowed for tax purposes is less than the normal depreciation charged to income in the company's books of account.

A major difficulty for electric utilities is that many state regulatory commissions permit or require utilities to treat the deferred tax credit as part of earned surplus. The result is that state orders permit one kind of accounting, while for purposes of Federal Power Commission regulation—and, potentially, for SEC purposes, too—a different system is required.

There's no doubt a great deal of debate will precede any change at SEC. When the commission made its proposal at the end of December, it invited comments up to Jan. 31. However, the comments received so far do not present the pros and cons of the fight. Instead, they show only either agreement or disagreement in general terms with SEC's stand.

The electric utilities most concerned have asked SEC for another month—until the end of February—to file their comments; SEC is going along with the request. In addition, more of the debate will be laid out in public hearings.

Here's a sample of the kind of confusion that exists, using Indiana & Michigan Electric Co as the example. It is one of American Electric Power's operating subsidiaries—and AEP is one of those requesting additional time to comment on SEC's proposal. The example also shows that this particular accounting problem has cropped up in state and federal regulatory agencies.

Normal Depreciation Used at I&ME

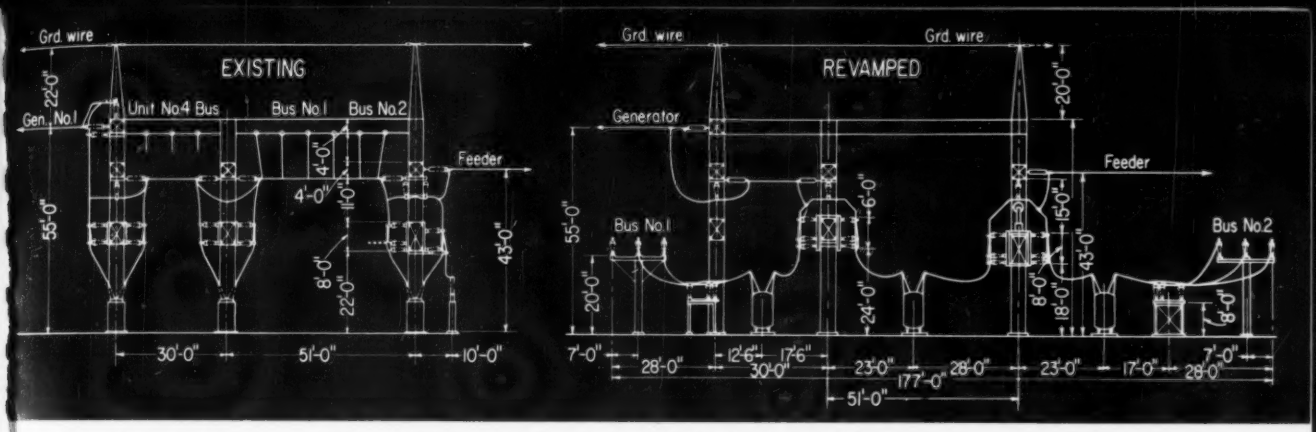
I&ME is one of those companies which deduct liberalized depreciation or accelerated amortization for tax purposes—but deducts only normal depreciation on its books of account. And—under a previous order of the Public Service Commissions of Indiana and Michigan—it is carrying the tax credits on its balance sheet as retained income, part of equity capital.

But on Dec. 24, 1957, the Indiana commission issued an order requiring companies under its jurisdiction to thereafter treat such deferred income taxes as a special reserve account, and not continue treating it as retained incomes account. (This is what FPC later required and which SEC proposes.)

Indiana Electric has challenged the legality of the state commission's 1957 order and, pending the outcome, has not changed its system.

On May 29, 1958, FPC issued its order—effective Jan. 1, 1958—in effect requiring a public utility which follows deferred tax accounting for state regulatory purposes to do so in filing with FPC, but without showing the deferred taxes in a reserve rather than as part of retained income.

Indiana, uncertain whether FPC can require it—as a subsidiary of a registered holding company—to change its accounting methods to conform to the May 1958 order, has not changed its system. And Indiana's latest financial statements filed with SEC—filed Nov. 1958 in connection with a prospectus on some mortgage bonds—include deferred federal income taxes as part of retained income.



EXISTING STRUCTURE is retained to support disconnects and line takeoffs in program which is substituting 3,810-amp tubular bus for 1,200-amp strain cables and gives capacity for the 583 Mva generating unit now under construction

Sporn Switchyard Keeps Pace

AEP 138-kv station uprates equipment, rearranges switching scheme to meet progressive load, capacity additions

H. B. MARGOLIS, Senior Engineer, American Electric Power Service Corp, New York, N. Y.

Philip Sporn Power Plant's 138-kv switchyard, an exemplary large, modern transmission switching station at its inception a decade ago, has undergone major modifications made urgent by skyrocketing loads and generating capacities. The plant, a major generating station of the American Electric Power System, is owned jointly by Appalachian Power and Ohio Power Companies. Its first two 150-Mw units went on the line in 1950, Unit 3 in 1951, and Unit 4 in 1952, when station capacity reached 600 Mw. Its entire output was stepped up for 138-kv transmission.

The 1950 layout afforded switching for seven lines and two cross-compound units, two generators per unit. By 1953 the 138-kv breakers numbered 19 and provided for four generating units and major system ties served by 11 139-kv lines. Two lines, Muskingum River and Kanawha River, were constructed for 345-kv operation. A 300-Mva, 138/345-kv autotransformer was installed to interconnect the 138 and 345-kv systems at Sporn.

When Ohio Valley Electric Corp was formed in 1952 to supply the Atomic Energy Commission's Portsmouth Diffusion Plant, Sporn Plant became an interconnection point and increased demands were made on it for interim, supplementary, and emergency power requirements. A double-circuit, 345-kv line was built to OVEC's Kyger Creek Plant. A 1955 agreement with Kaiser Aluminum & Chemical Co brought an aluminum reduction plant to the Sporn area with a projected load of 500 Mw and possibly greater.

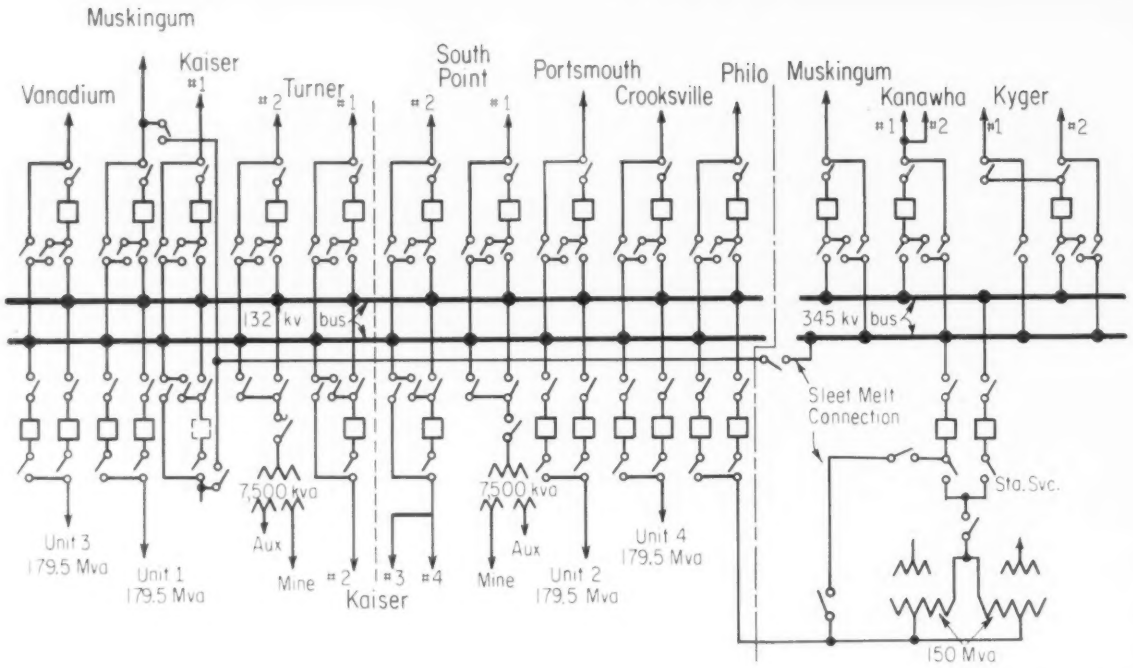
Scheme Was Standard

The switching scheme at the 138-kv station in 1955 was a double and transfer-bus arrangement, more or less standard then for large AEP switching stations. Each generator had two 138-kv breakers; each line, a breaker, selector switches to either bus, and a bypass switch. One generator breaker, designated a bus-tie breaker, had line transfer relays. The 5,000-Mva OCB's were the largest at that voltage as late as 1953. But installation of the 138/345-kv autotransformer raised the interrupting duty beyond the breakers' 5,000-Mva limit and helped to point up the need for higher-interrupting-capacity breakers. Thus the 5,000-Mva units were replaced with newly developed 10,000-Mva ones in 1954.

In a 138-kv switching bay, a 51-ft square area accommodated two buses. Bus selector switches on the line breakers were in a vertical "V" arrangement, and a single stack of insulators at the vertex served two switches. The two buses were close at this point. A 30-ft sub-bay contained two generator breakers. Cross buses tied generator and line breakers to the main buses. Line traps and capacitors for each line were outside. Feeder bypass switches, center-break type, were mounted inverted. The 1,200-amp main buses were mostly 1,000-MCM copper strain buses, tied to the cross buses by jumpers. Jumpers and cross buses were 500 or 750-MCM copper.

This arrangement served in a generally satisfactory manner until 1958. But construction of a 450-Mw Unit 5 had been authorized with a view to 1960 operation. As major loads out of the station, particularly the aluminum load, were served at 138-kv, Unit 5 will connect to the 138-kv bus.

Plainly, the switching station was inadequate for the projected loads. Shortcomings first apparent in 1955 would become aggravated in new circumstances. For work on a breaker or associated equipment, or to melt sleet, all but one circuit had to be transferred to one bus. As circuits multiplied, so did the possibilities of switching errors. Furthermore, switching is time consuming, which depreciates sleet-melting procedures. Maintenance suffers as operators become reluctant to perform switching for any except the most pressing duties. Any expansion of the switching arrangement for new loads and new



MAIN-AND-TRANSFER BUS SCHEME had grown to 19 positions at 138 kv and five at 345 kv and reached fault current limits of breakers and disconnects. Original installation had served two generating units and seven 138-kv lines

generation compounds complications and hazards.

The switching station had other shortcomings: The proximity of two buses, particularly near the selector switches, left the installation susceptible to double-bus faults which would bring a complete outage. Although not often, Sporn and similar switching stations have experienced some. The double-bus arrangement is especially vulnerable when lines have been transferred for maintenance or sleet melting. The current-carrying capacity of the main bus was another deficiency. The 1,000-MCM copper strain bus was rated at 1,200 amp. With the Kaiser load up to 500 Mw and another 450-Mw unit on the 138-kv bus, the bus loading would be up to 3,000 amp.

When the station was built, momentary ratings for disconnect switches had not been established. Investigation showed that most switches were not good for much more than 20,000 amp. By 1966, momentary duty will be up to 100,000 amp.

With regard to clearance, although AEP standard 7-ft phase and 5-ft ground spacings were observed, replacement of equipment with larger units, such as 3,000 for 1,200-amp switches, would cut metal-to-metal clearances below acceptable limits. By 1966, breaker duties at Sporn should be near 13,000 Mva. Consideration of these inadequacies led to setting these objectives for the station:

1. A bus to handle at least 3,300 amp continuously.

2. Equipment for 15,000-Mva fault duty.

3. Phase and ground clearances in accordance with today's standards.

4. A simplified switching arrangement reducing the chances of switching errors and the time for switching.

5. Elimination of the possibility of a station outage.

6. Expeditious and effective sleet melting.

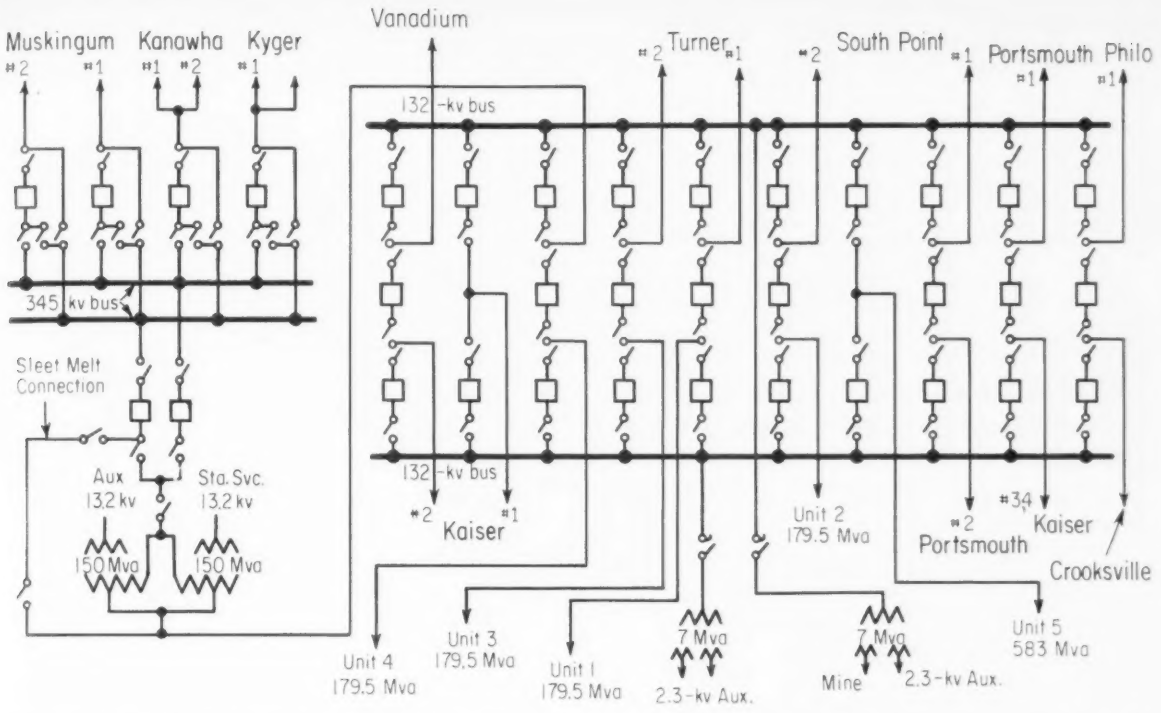
7. Easier equipment maintenance.

8. These objectives attained at minimum cost and service interruption during construction.

The breaker-and-a-half switching arrangement was expected to bring many of these advantages. Minimal switching takes any breaker in a bay out of service, full breaker and relay protection continuing for each line and generator. Bypassing breakers or switching relays is unnecessary. Switching for sleet melting has been minimized. The two buses are on opposite sides of the station, so that a double-bus outage is most unlikely. But, were the unlikely to happen, the station continues to function. The switching arrangement also permits one bus to be taken out for maintenance or for sleet melting at almost any time.

Relocation Minimized

The real problem, however, was deciding whether the arrangement of generators and lines lent itself to this scheme, and whether it was practicable to continue using existing structures and equipment. The final arrangement of generators and lines, though not ideal, satisfied operating requirements with a minimum of relocation. Space on each side of the structure was available for ground-mounted buses, and the structure itself could be used for mounting switches and for line take-offs and cross connections. As, in any event, new buswork was



BREAKER-AND-A-HALF SCHEME will provide facilities for new 583-Mva unit under construction and new transmission lines. It also gains required current capacities and desirable flexibility in both operation and subsequent maintenance

needed, adaptation of the structure assured that conversion would be at minimum cost.

The one-and-a-half OCB scheme calls for two additional breakers over the standard two-bus arrangement. Were the two-bus scheme expanded, however, bus sectionalizing would have been added so the additional breakers were not charged against the new scheme. Disconnects were fewer than in the two-bus scheme.

In line with the station's enlargement, and because critical switching time would be cut to 7 cycles, measures were taken to increase the reliability of relay operations. Separate bushing current transformers were used for carrier-current relays and back-up relays to assure positive operation despite trouble in BCT's or associated circuits. Individual line potentials from coupling capacitors for line relays have replaced bus potentials. A new, more positive scheme of breaker-failure relaying was provided.

A cross-section of a converted bay would show a ground-mounted rigid bus of 5-in. aluminum tubing. The tubing, having a capacity of 3,810 amp, is on single-column structures parallel to the station structure. Buses were welded and spaced 7 ft apart. The spacing is maintained despite high short-circuit stresses by using a single high-strength insulator at the stack's bottom. By paying a little more for this insulator, a large saving was made in station cost, and a minimum bus safety factor of 1.46 was obtained.

Old Breakers Re-used

Old breakers were re-used. New requirements were filled by purchasing breakers with a rated interrupting capacity of 15,000 Mva and a supplementary rating of 2,500 amp, 45C rise on contacts. For some existing breakers additional BCT's were needed. Station modernization required replacement of 46 disconnect switches, most of them rated 1,200 amp, 20,000 amp momentary. These made way for 1,600 or 3,000-amp switches with 100,000 amp momentary.

Bus-side disconnect switches are ground mounted; line-side disconnects are on trusses which have been reinforced and redrilled. All breakers are on new foundations.

The method of conversion allowed for installing foundations and considerable equipment and structures without disturbance to the installation. The equipment included new buses. Then a tie was provided between old and new buses so that the new ones essentially extended the existing ones. Thus stability and relaying problems were minimized. "Hot" work was kept to the minimum, involving only the dropping of bus jumpers at the connection to the old buses and the installation of bus-tie disconnects.

The de-energized working condition was obtained with minimum service interruption by starting in an empty bay. This was made available through rearranging potential transformers and reserve transformer connections, and then equipping and wiring the bay. Generator and line leads were then swung over from an adjacent bay to the newly equipped one, thus de-energizing the second bay and releasing it for conversion.

About three months were taken in laying the ground work for the conversion in the form of foundations, buswork, assembling, and aligning disconnects. Conversion proceeded at one bay per month.

Adequate Industrial Relaying Means T

This is a direct appeal to private and industrial consulting engineers, to electric utility representatives, and to power users for increased cooperation as an aid to improving power users' electrical service through better design of his electrical protection.

The author has been associated closely with manufacturing, application, and active use of protective relays for 32 years. Sale of this equipment is highly competitive and economics are paramount, often resulting in consulting engineers considering only the customer's circuit requirements. Needed coordination between users' equipment and the utility's is often neglected, unless the utility requires that the customer's circuitry be approved before connection.

Consultants are obligated to prepare recommendations economically and quickly, but some fail to take full advantage of available information.

M. A. BOSTWICK, Protection Engineer, Portland General Electric Co, Portland, Oregon

An inadequately-protected electrical system all too often is found in the most modern industrial or commercial installation. The intermediate-sized power user — the small industry, commercial establishment, large hospital, or public building is frequently subjected to inferior service because of nonselective protection. Many do not realize it.

Practically all modern installations are adequately constructed in terms of protective device circuit capacity, switching flexibility and interrupting capacity. Unfortunately, too many lack selectivity, the ability to detect and interrupt only that portion of the circuit immediately affected by insulation failure.

Improvements in users' protective equipment can be gained with no appreciable added cost by one of two procedures:

- The serving utility can place strict requirements on all new installations, and insist that protective schemes be approved by utility protection engineers before connection.
- Voluntary consultation among consulting engineer, customer's engineer, and utility's engineer can provide the most economical and useful protective circuitry. Many utilities follow the first procedure in varying degree. However, the greatest improvement can be gained by the second.

Well-designed and excellently constructed equipment is being installed to make large industrial systems comparable to modern utility systems. Great care is used to provide adequate power and fault current interrupting capacity, and in protective device selection, to insure only the faulty apparatus or line is interrupted on trouble. This is good economics, avoiding unnecessary interruption of costly processes and loss of manpower.

Successful operation of most large industrials shows equipment and know-how are available to extend these techniques to the medium-sized user.

Smaller power users must be cost-conscious. Economic requirements, demands for simplicity in operation, infrequent insulation failures, and lack of sufficient time spent consulting utility engineers, combine to reduce their protection quality.

The following examples demonstrate how better economic solutions to the power user's problem of providing selective protection can be gained by the cooperation of all interested engineers.

Example No. 1—In this installation (Fig 1) excellent equipment is installed. Duplicate power sources are provided, with automatic throwover, to assure continuous power to a large building. Induction disc relays and a storage battery assure positive operation.

However, the definite time relays used here cannot be made to operate selectively with fuse protection of the cabled leads to the underground vault. As a result, the overload relays are practically useless and the value of the circuit breakers is reduced to that of automatic switches. Any fault ahead of the secondary fusing will be cleared by the cable fuses. A bus fault will blow one source fuse; the breakers will transfer to the second source and blow the second set of fuses. Service restoration will be delayed

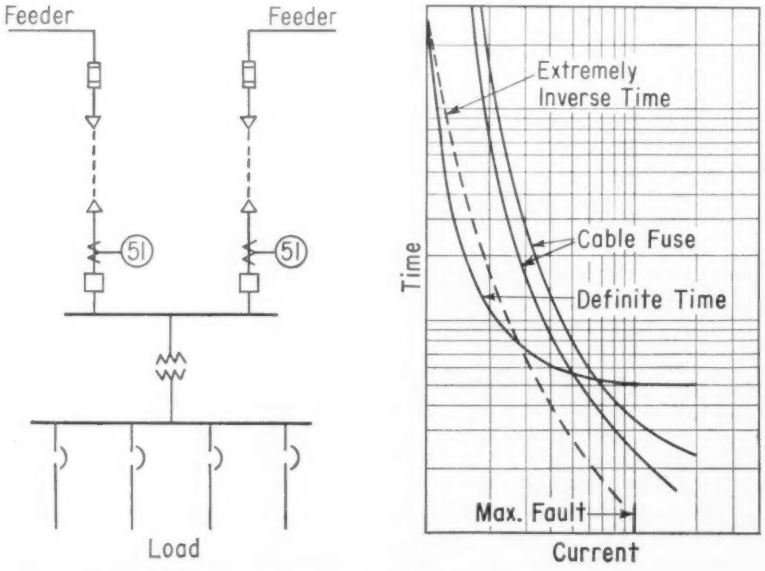


FIG 1—EFFECTIVENESS OF RELAYS and breakers here is impaired because definite time characteristic of relays will not operate selectively with fuses

Three-Way Engineering Teamwork

until the utility restores a source circuit.

Installation of extremely inverse relays, by a simple exchange, would have provided means for clearing the fault by breaker action and limited damage by blocking the throwover. Service could be restored immediately after the faulty apparatus was removed, simply by closing a breaker.

The customer was advised that the relays could have been exchanged at no appreciable cost, simply by drawing out the definite time relay and sliding in an extremely inverse relay. Note the difference in time that would have given the desired selective action. In spite of the simplicity of the necessary change, no action has been taken to improve the installation.

Example No. 2—This involved an industrial plant having two generators, four feeders, and a tie to the local electric utility (Fig 2). New metalclad switchgear in this plant employed cascading of breakers with direct-trip devices, as an economic measure.

The utility tie breaker was controlled by an underfrequency and a set of induction disc overload relays. The instantaneous trips on feeders and generators were set so low the entire plant was shut down every time the utility lines were faulted within several miles radius.

Considerable effort finally convinced the customer his breaker settings were the source of his trouble. As an immediate remedy, he obtained selective protection by desensitizing generator protection and setting tie breaker relays fast and low; but this limited power purchases. Utility representatives advised him to obtain a set of directional overcurrent relays for fast, sensitive protection against utility system faults, and use the non-directional overload relays with high settings for less sensitive protection against plant faults.

The customer's agreement was obtained with difficulty. Then the consultant changed the utility recommendations and ordered a reverse power relay instead of directional overloads. After several months delay, with restricted operations and needless shutdowns, the installation was corrected.

Why should such a loss be imposed on a mutual customer?

Example No. 3—This involves installation of too many protective devices in a limited area. It is particularly undesirable because series devices have different time-current characteristics. The problem is often met in laying out protection for large commercial areas, an extensive shopping district, or a hospital area which includes many buildings with several control centers in each of the buildings.

The combination of fuses, direct-trip breakers with "dog-leg" trip curves, and protective relays is particularly difficult to coordinate. Such arrangements are frequently installed despite the need for selective protection.

Fig 3 is a typical circuit. In one installation it was found advisable to make a number of breakers inoperative and to install fuses to provide selective protection! The "dog-leg" time-current characteristic is particularly bothersome when used between fuses and breakers controlled by protective relays.

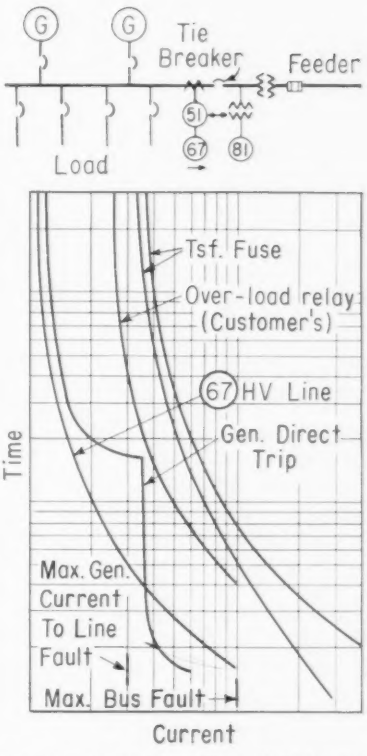
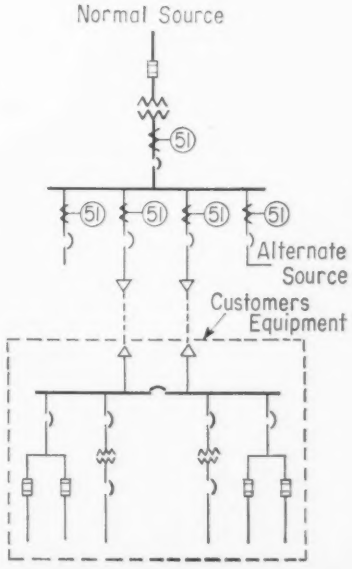


FIG 2—ADDITION OF DIRECTIONAL relays remedied excessive sensitivity of direct trips on generators and feeders and simple overload on tie breaker



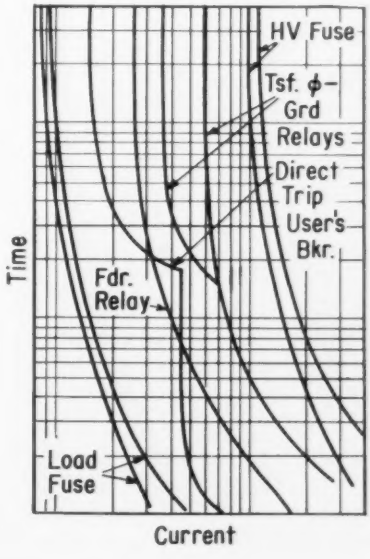


FIG 3—TOO MANY PROTECTIVE devices is common flaw in large commercial loads. Different time-current characteristics make coordination difficult

Test Instrument Transformer

F. R. D'ENTREMONT, Consulting Engineer, Instrument Department, General Electric Co, Lynn, Mass.

The most difficult problem in determining whether reclaimed instrument transformers are suitable for reuse is the estimation of probable life expectancy. Although no available test will accurately evaluate life expectancy, a test of internal ionization will give some indication of failure possibilities.

The "Resonant Circuit Method" can measure ionization in dry-type instrument transformers. A variable autotransformer supplies 60-cps voltage of the desired magnitude. The high voltage lead of a supply transformer is connected to one terminal of a high voltage capacitor and to the high voltage winding of the transformer under test through a 0.2-h rf choke.

The choke prevents any high frequency disturbance from the 60-cps source or high voltage supply transformer occurring across the test circuit. It also prevents disturbances caused by ionization in the test piece from being damped out by the supply circuit.

The secondary winding and core of the test transformer are connected to ground through a 500-h toroidally-wound choke, which is the detecting means. This choke is enclosed in a grounded electrostatic shield.

When the power frequency voltage is increased to a value causing ionization in the test piece, each breakdown of a small void will cause a disturbance in the test circuit. Each disturbance will initiate a discharge of small magnitude through the low voltage choke and the high voltage capacitor. The circuit constants have been chosen so that each disturbance appears as a damped 0.25 mc wave of a few cycles.

Magnitude of the first peak of the damped high frequency wave is proportional to the energy in insulation voids. The number of damped waves is determined by the number of times the voids break down.

The high frequency voltage is measured by connecting a high pass filter across the low voltage choke to eliminate any small amount of residual 60-cps voltage that might be present. The high frequency voltage is then passed through an amplifier with a voltage gain of about 100.

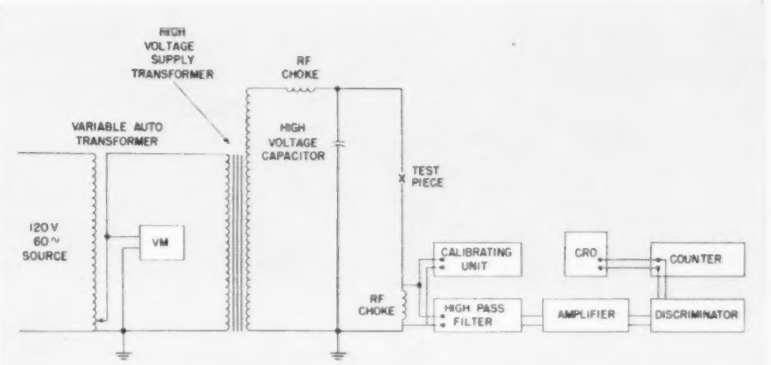
The amplified output is passed through a discriminator and an electronic counter. The discriminator, actually a half-wave rectifier, provides a means for biasing the output voltage to cut off all voltage peaks below the desired value. This permits evaluating the number of ionization pulses within various ranges of ionization voltage for each power frequency cycle.

Aluminum-Clad

EDWARD F. BOWE, Asst Superintendent, Outside Plant Construction, Consolidated Edison Co, Mount Vernon, N. Y.

An effective stringing arrangement was used to install new-type aluminum-clad stranded-steel conductors in place of plow steel conductor during the recent modernization of a 2,900-ft crossing over Croton Lake at Yorktown Heights, N. Y. on the Consolidated Edison Co system. The old steel conductors, of ½ in. diameter, had been installed in 1934 and were supported on original insulators from 80-ft steel towers erected in 1916. The new conductors were installed to correct a rust condition and increase circuit capacity. New insulators

er Condition



FACTORY IONIZATION TEST SCHEMATIC DIAGRAM

The ionization test supplements the standard short-time, high-frequency test which does not measure the expected life of the device under test. The high potential test indicates only that there is sufficient insulation to permit application of voltage much in excess of operating voltage for a short period of time. Such high voltage, even for a short time, may actually shorten the life of the device when it is used at normal voltage.

The best method available for detecting turn-to-turn failures in potential transformers is to make ratio and phase angle tests. If a source of power is available to supply voltage at two or more times normal frequency, double rated voltage applied prior to the ratio and phase angle test will aid in the detection of turn-to-turn failures.

When attempting to detect turn-to-turn failures in current transformers, the tester should demagnetize the transformer just prior to making ratio and phase angle tests. The simplest method of demagnetizing the transformer is to make provisions in the secondary test circuit so that a continuously adjustable resistor, of about 50 ohms maximum resistance, can be inserted as burden and reduced to zero. The secondary current should be at rated value prior to inserting the demagnetizing resistor. When the resistor is in the secondary circuit, the value of voltage across the secondary terminals will be several times that normally obtained during operation. If a failure is going to occur, it should happen during this time.

In addition to the tests, a mechanical inspection will indicate the general deterioration of the transformer.

d Conductors Replace Steel at Crossings

were also installed on the line.

Two 13-kv feeder circuits and a shield wire were involved in the reconductoring operation which was done one-conductor-per-day due to load conditions that required both circuits to be in operation at time of evening peak each day. As a consequence, each new Alumoweld conductor had to be sagged, deadended and completed each night. It could not be strung one day and left over night for sagging the following day.

The operation was performed using a tensioning machine and reel trailer combination to hold 2,200 lb tension on conductors as they were pulled in to keep them clear of the trees and the road crossings.

Pulling in was done by a line truck 1,000 ft beyond the tower on one side of the lake. The old conductor was first cut clear of the insulators on the opposite shore, then dropped into a steel snatch block and a ½-in. preformed-type dead end used to connect it with the pulling eye of the truck's steel winch cable. Meanwhile on the far shore the old ½-in. steel conductor was joined to the 9/16-in. Alumoweld by a straight ½-in. steel preformed splice, and used to pull it into place. This arrangement let the old and new conductor and splice be pulled through the stringing blocks without snagging.

The adequacy of this arrangement was established by a field test in which a 10-ft length of 9/16-in. Alumoweld, joined by a ½-in. preformed splice to a similar 10-ft section of ½-in. plow steel conductor, was pulled to 6,000 lb tension. No movement was apparent in either conductor at the splice. To simulate the condition of conductors going slack and being pulled taut, a set of 6-in. blocks were pulled to 5,000 lb tension and released. There was no apparent slipping of the splice at the conductors.

The new conductors were sagged to 125 ft at 4,500 lb tension. This compares with 130 ft sag for the old plow-steel conductors.

Minor Materials System Cuts Cost

Georgia Power Co's system utilizes a loading factor to simplify storing, handling, and accounting of minor materials. Loading factor is based on current operating conditions

ORBIE M. CAMPBELL, Distribution Engineer, Georgia Power Co, Atlanta, Ga.

A simple system for storing, handling, and accounting of minor materials was recently set up by Georgia Power Co. Use of the system has cut costs, improved morale by eliminating tedious work, and improved the quality while preserving the integrity of plant accounts.

Basic elements of the system are:

1. Minor materials are supplied to district storerooms through the general warehouse where detailed stock records are kept.

2. District storerooms are charged with the value of minor materials ordered and supply overhead crews without accounting.

3. A loading factor applied to major items of material enables the Accounting Department to charge minor materials to appropriate accounts and credit various district storerooms.

This system is the result of an extensive study made by a committee set up by management, with representatives from Stores, Accounting, and Operating Departments. The committee found that minor materials represented about 17% of the dollar value and 92% of the quantity of transactions.

The minor materials system adopted is limited to those items that have been expressly authorized. In the list are over 300 items that are repeatedly used but of little value except when used with items of major materials. Cheapest item on the list is a round washer costing less than 1¢, and most expensive item is a $4.37 strain wire clamp. Nothing may be added to or removed from the list except by formal revisions, which will be made at intervals of not less than one year.

The system applies only to overhead line crews supervised by division offices and assigned transmission or distribution work in connection with construction, operation or maintenance. Company-wide construction crews, supervised from the general office, substation crews and underground crews are excluded. But some of these crews may be included in the future.

Because of these exclusions, the system is designed to operate only on items of major material normally used in overhead line work. All job-order work is excluded from the plan because of the special accounting problems and the difficulty in rendering a valid, itemized bill to the customer.

In district storerooms minor materials are set up in special bins, segregated from other materials. Quantity of each item is controlled visually and limited to a 60-day supply. Crews are supplied without stock slips. Truck loading instructions are given to the stock clerk in the form of memoranda that are not subjected to any accounting but are filed or disposed of locally.

Minor materials are supplied from and returned to the general warehouse by means of two special stock slips, preprinted with the more commonly used items. Operating personnel use the supply slips as convenient truck loading memoranda forms.

To requisition minor materials for a crew which is not covered by this plan, a miscellaneous stock slip is prepared itemizing the materials required. These slips are subjected to the routine accounting procedure, charging the appropriate account and crediting the minor material account of the storeroom which made the issues.

All minor material will be inventoried annually throughout the company. The minor material account for each division will be balanced by charging the account with the previous inventory plus orders during the year and crediting the account with the current inventory plus the credits given by the operation of this plan.

Several methods of assigning cost of minor materials to final accounts were considered. One was charging minor items to clearing accounts when purchased. Another involved determining a historical ratio for the dollar values of minor materials to major items and applying the ratio to future operations. A third method was to use

(*Continued on page* 88)

Adapted from a paper presented at the Southeastern Electric Exchange Engineering & Operation Section meeting in Biloxi, Miss.

Weighed Average Quantity and Amount of Minor Materials For Installing Plant Unit

Plant Unit	Minor Material	Quantity	Price	Amount
	Machine Bolts 1/4", 5/16" x 3/8"	1.592	$0.11	$0.175
	Machine Bolts 5/8" x 3/4" over 4"	1.108	0.29	0.321
	Space Bolts	0.550	0.59	0.325
	Cross Arm Braces	0.795	0.41	0.326
	Cross Arm Braces (Alley)	0.004	2.14	0.009
Arms, Cross	Insulator Fittings	0.125	0.46	0.058
	Brace Gains	0.005	2.53	0.013
4 Pin, 6 Pin	Pole Gains	0.397	0.55	0.218
4" x 6" x 8'	M. F. Lock Nut	1.500	0.02	0.030
	Cross Arm Pins	0.117	1.75	0.205
	Cross Arm Pins — 1" Thread	0.667	0.71	0.474
	Trans. End Pins	0.072	0.47	0.034
	Lag Screws	0.792	0.07	0.055
	Round Washers	2.273	0.01	0.023
	Square Washers	2.607	0.05	0.130
				$2.396

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Old Style

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When this advertisement appeared in 1958, more than eight million General Electric watthour meters with magnetic suspension were operating without electrical failure. Today—one year and one million meters later—the same high standards of reliability and accuracy characterize G-E meters.

Why does General Electric

A FUNDAMENTAL DISCUSSION OF 32-STEP REGULATORS

by M. W. GANGEL, Distribution Systems, Electric Utility Application Engineering, General Electric Company.

advocate 32-step regulators?

ANSWER: Because 32-step regulators offer three fundamental benefits which add up to extra profit:

1. **EXTRA FEEDER LENGTH**
2. **EXTRA FEEDER CAPACITY**
3. **EXTRA FEEDER REVENUE**

QUESTION: What characteristics of a 32-step regulator make possible these added benefits?

ANSWER: Basically, the step size. It is fundamental that with the smaller step size, the bandwidth can be narrower, regardless of any other considerations. The theoretical minimum bandwidth which can be set is equal to the step size. Under actual conditions, the minimum bandwidth is approximately 115 percent of the step size, plus an adder of from ½ volt to one volt, depending upon the type of control involved. This results in a minimum practical bandwidth setting of approximately 1½ volts for a 32-step regulator and approximately three volts for a 16-step regulator. The *difference of 1½ volts is a dividend in favor of 32-step regulators.*

QUESTION: Why do discussions of regulators lead to the topic of bandwidth?

ANSWER: Bandwidth is an economical source of extra volts . . . volts available for profitable re-investment. Volts used in bandwidth are not available for work out on the feeder. For every volt taken out of the bandwidth, the average voltage to each consumer is improved by ½ volt, and the minimum voltage to each consumer is likewise improved by one volt.

QUESTION: Where can volts from the bandwidth of 32-step regulators be re-invested for greater distribution system economy?

ANSWER: The 1½-volt dividend available only from 32-step regulators will allow additional growth on a feeder without exceeding acceptable voltage limitations. For example, with a permissible four-volt primary circuit drop, the 1½ volts taken from the bandwidth and put to work on the primary circuit permits a *load increase of 37½ percent.* If, on the same primary feeder, the feeder length is increased in an area of uniform load density, the 1½ volts taken from the bandwidth of 32-step regulators can be utilized to provide a *17-percent increase in feeder length* without exceeding the voltage limitations of the feeder.

QUESTION: Can these 32-step regulator advantages affect revenue?

ANSWER: Yes. Revenue is a function of the voltage level at the consumer location. The 1½ volts saved from the bandwidth of 32-step regulators increases the consumers' average voltage level by 0.75 volts. This important contribution to revenue can be calculated very simply by inserting local electric utility values into the following equation:

43.8* × Load Factor × Annual Peak KW × rate in dollars per KW-HR = R

R = Annual revenue which can be gained by utilizing the bandwidth dividend available only from 32-step regulators.

* The factor of 43.8 is the product of: 1) 8760 hours per year; 2) 0.5, which represents the assumed ratio of the amount of voltage-sensitive kw-hr load to the total kw-hr load; and 3) 0.01, the increase in each kw-hr of voltage-sensitive load corresponding to a 0.75-volt average voltage level increase at the consumer location.

QUESTION: This means that it is quite easy to calculate direct savings from the benefits which the 32-step regulators provide?

ANSWER: Definitely. Simply by setting this reduced bandwidth utilities can begin accruing measurable benefits in terms of reduced system investment and increased revenue. This contribution to profit is one important reason why more General Electric ML-32 step regulators are in service today than any other kind. 423-40

YOUR GENERAL ELECTRIC SALES ENGINEER can give you further details which show why G-E 32-step regulators cost less on the line. General Electric Company, Schenectady, New York.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Charts Aid Capacitor Fuse Selection

- Establishment of NEMA standard tank rupture curves makes uniform fusing practical
- Curves and bar charts simplify fuse selection

H. C. STONE, Development Engineer, Line Material Industries, Milwaukee, Wisconsin

Uniform fusing practices for shunt capacitors have been made possible by a NEMA agreement to establish industry-wide tank rupture curves. These curves are essential to the correct selection of fuses for overcurrent protection of any capacitor installation. Fuse selection is based upon the probability of tank rupture indicated by the new curves and the maximum clearing time characteristic of a fuse link.

In the past, tank rupture curves of different manufacturers have not been completely coincident. Fusing practices, therefore, have tended to vary.

Develop New Curves

New curves, shown in Fig. 1 and 2 for 25- and 50-kvar units, respectively, facilitate capacitor fusing in four zones that indicate the degree of safety possible. Maximum clearing time curve of a link and the maximum available short-circuit current at the bank establish the zone of operation. For example,

(*Continued on page* 64)

Current-vs-time for capacitors to rupture due to gas pressure caused by internal arcing

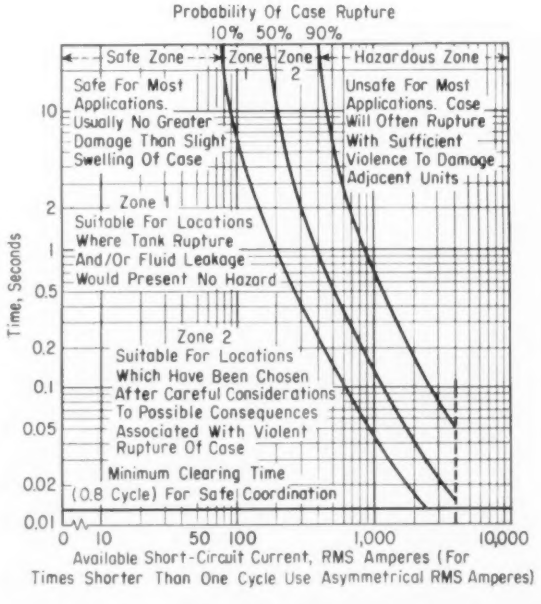

Probability Of Case Rupture
10% 50% 90%
Safe Zone
Zone 1
Zone 2
Hazardous Zone
Safe For Most Applications. Usually No Greater Damage Than Slight Swelling Of Case
Unsafe For Most Applications. Case Will Often Rupture With Sufficient Violence To Damage Adjacent Units
Zone 1 Suitable For Locations Where Tank Rupture And/Or Fluid Leakage Would Present No Hazard
Zone 2 Suitable For Locations Which Have Been Chosen After Careful Considerations To Possible Consequences Associated With Violent Rupture Of Case
Minimum Clearing Time (0.8 Cycle) For Safe Coordination
Time, Seconds
10
2
1
0.5
0.2
0.1
0.05
0.02
0.01
0
10
50
100
1,000
10,000
Available Short-Circuit Current, RMS Amperes (For Times Shorter Than One Cycle Use Asymmetrical RMS Amperes)

Fig. 1. Probability for 25-kvar capacitors

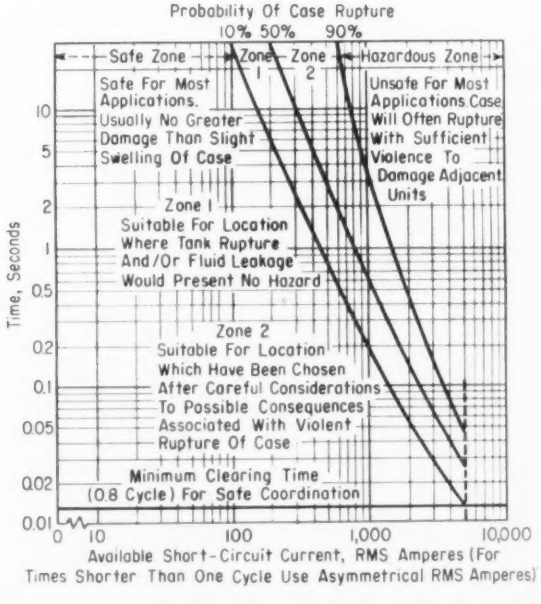
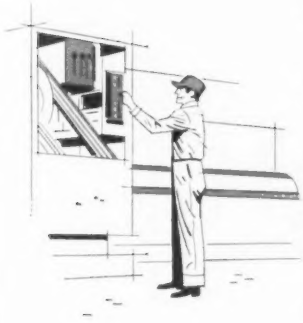

Probability Of Case Rupture
10% 50% 90%
Safe Zone
Zone 1
Zone 2
Hazardous Zone
Safe For Most Applications. Usually No Greater Damage Than Slight Swelling Of Case
Unsafe For Most Applications Case Will Often Rupture With Sufficient Violence To Damage Adjacent Units
Zone 1 Suitable For Location Where Tank Rupture And/Or Fluid Leakage Would Present No Hazard
Zone 2 Suitable For Location Which Have Been Chosen After Careful Considerations To Possible Consequences Associated With Violent Rupture Of Case
Minimum Clearing Time (0.8 Cycle) For Safe Coordination
Time, Seconds
10
5
2
1
0.5
0.2
0.1
0.05
0.02
0.01
0
10
100
1,000
10,000
Available Short-Circuit Current, RMS Amperes (For Times Shorter Than One Cycle Use Asymmetrical RMS Amperes)

Fig. 2. Probability for 50-kvar capacitors

ELECTRICITY builds*---JOBS....

build-in greater load-building capacity with Republic ELECTRUNITE E.M.T.



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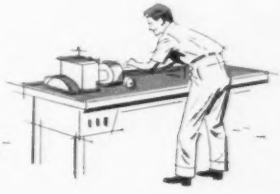
Future load-building capacity is built-in.

Learn why utilities are using ELECTRUNITE E.M.T. in their expansion programs and suggesting it to their customers as the practical way to provide for the future. Call your Republic representative. Or, send coupon today.



* Republic builds, too. Contracts are being let to increase capacity for production of ELECTRUNITE E.M.T. Your acceptance has made this expansion necessary.

NATIONAL ELECTRICAL WEEK

FEB. 8-14, 1959

REPUBLIC STEEL
STEEL AND TUBES DIVISION

REPUBLIC STEEL

Cleveland 8, Ohio

REPUBLIC STEEL CORPORATION
STEEL AND TUBES DIVISION
DEPT. C-6888-B
213 EAST 131st STREET • CLEVELAND 8, OHIO

I am interested in learning more about the advantages and economies of Republic ELECTRUNITE E.M.T.

Name_____ Title_____

Firm_____

Address_____

City_____ Zone____ State_____

(Continued from page 62)

a capacitor bank of 50-kvar units would have Zone 1 fusing if maximum available current were 1,000 amp and a 65T link were used. The same bank would have Zone 2 fusing if an 80T link were employed.

Use of tank rupture curves as the basis for fusing provides assurance that occurrence of undesirable conditions will be unlikely. Field records of capacitor service indicate the units are most reliable, for annually less than 0.1% of all units in service experience any difficulties.

In addition to this fundamental principle for capacitor fuse selection, some other basic principles which must be observed are:

1. The fuse must be capable of continuously carrying 135% of the rated capacitor current.

2. It must have sufficient interrupting capacity to handle successfully the available fault current.

3. It must withstand, without damage, the normal transient current during bank energizing or de-energizing and it must withstand the unit's discharge current during a terminal-to-terminal short.

4. For ungrounded wye banks, where maximum fault current is limited to three times normal line current, the fuse must clear within five minutes at 95% of available fault current.

5. For effective capacitor protection, maximum fault current should not exceed 5,000 amp through a shorted 50-kvar capacitor unit or 4,000 amp through a shorted 25-kvar unit.

Bar Charts Aid Fuse Selections

Simplification of fuse selection has been achieved by the preparation of the bar charts shown in Figs. 3 and 4 for 25- and 50-kvar capacitors, respectively. These charts, adhering to the principles for capacitor fusing, are applicable to delta, grounded wye, and ungrounded wye banks. Only rated current and connection of the bank, as well as unit kvar rating, need be known to use the charts.

In many cases, more than one size of fuse link may be selected. The best selection would be the smallest link because it will provide better performance and protection.

Fusing recommendations for capacitors based on NEMA tank rupture curves

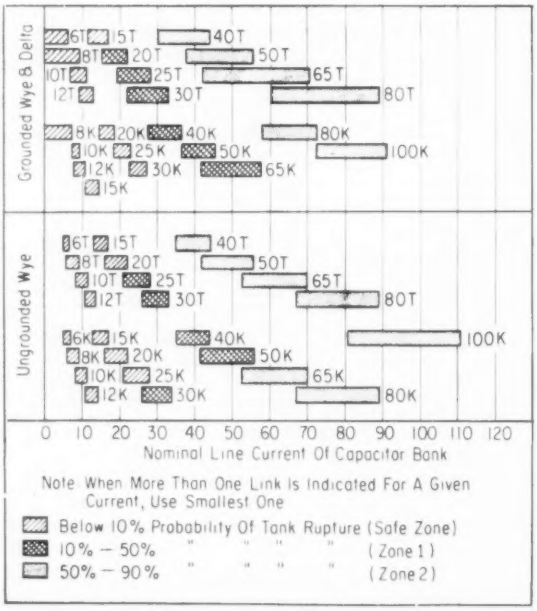

Grounded Wye & Delta
6T 15T 40T
8T 20T 50T
10T 25T 65T
12T 30T 80T
8K 20K 40K 80K
10K 25K 50K 100K
12K 30K 65K
15K
Ungrounded Wye
6T 15T 40T
8T 20T 50T
10T 25T 65T
12T 30T 80T
6K 15K 40K 100K
8K 20K 50K
10K 25K 65K
12K 30K 80K
0 10 20 30 40 50 60 70 80 90 100 110 120
Nominal Line Current Of Capacitor Bank
Note: When More Than One Link Is Indicated For A Given Current, Use Smallest One
Below 10% Probability Of Tank Rupture (Safe Zone)
10% – 50% " " " " (Zone 1)
50% – 90% " " " " (Zone 2)

Fig. 3. Fusing for 25-kvar capacitors

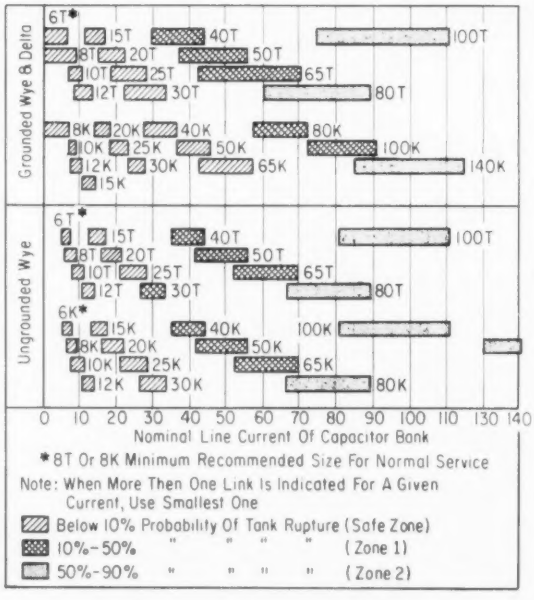
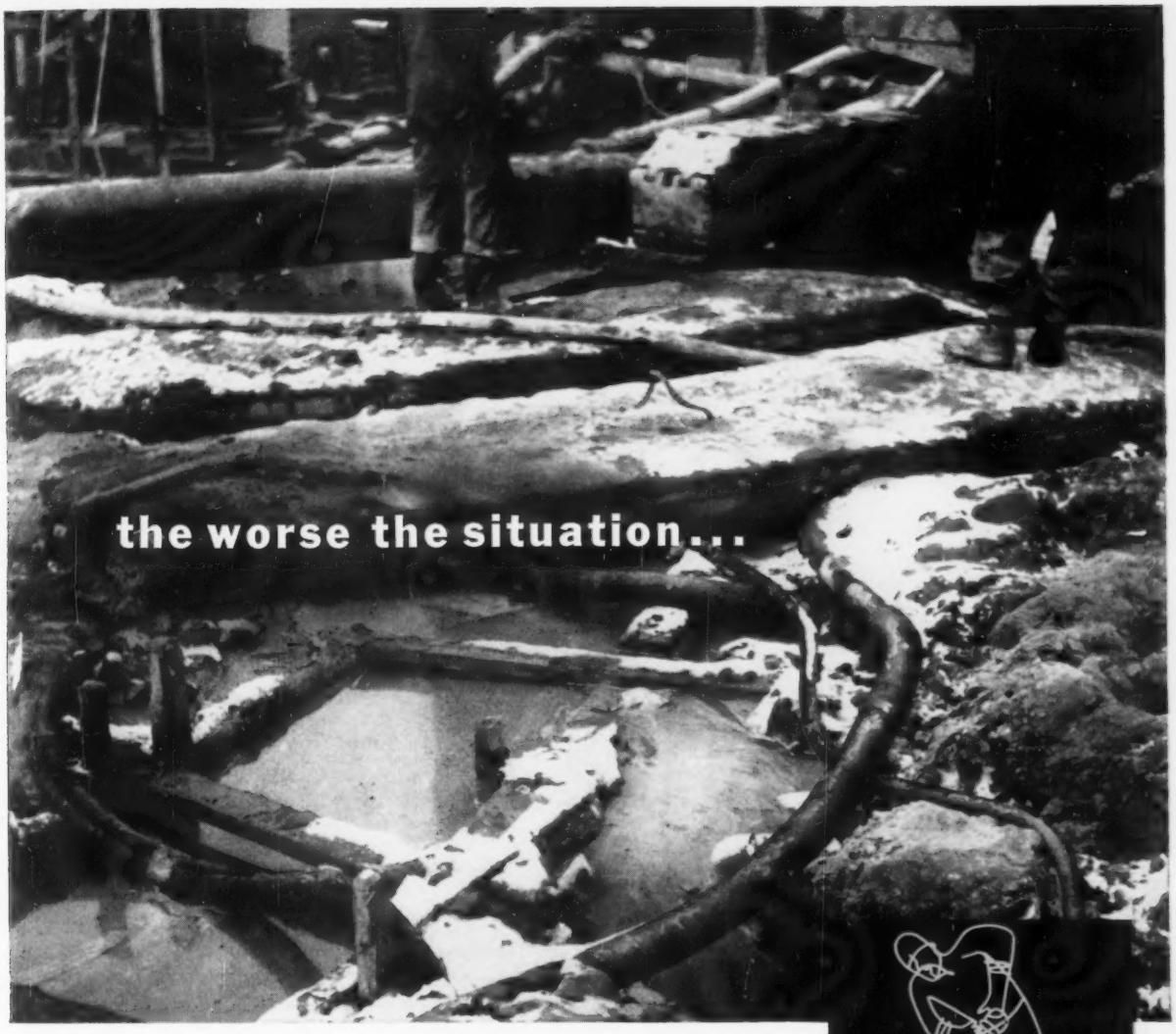

Grounded Wye & Delta
6T* 15T 40T 100T
8T 20T 50T
10T 25T 65T
12T 30T 80T
8K 20K 40K 80K
10K 25K 50K 100K
12K 30K 65K 140K
15K
Ungrounded Wye
6T* 15T 40T 100T
8T 20T 50T
10T 25T 65T
12T 30T 80T
6K* 15K 40K 100K
8K 20K 50K
10K 25K 65K
12K 30K 80K
0 10 20 30 40 50 60 70 80 90 100 110 130 140
Nominal Line Current Of Capacitor Bank
*8T Or 8K Minimum Recommended Size For Normal Service
Note: When More Then One Link Is Indicated For A Given Current, Use Smallest One
Below 10% Probability Of Tank Rupture (Safe Zone)
10%-50% " " " " (Zone 1)
50%-90% " " " " (Zone 2)

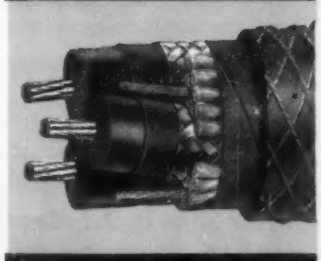
Fig. 4. Fusing for 50-kvar capacitors

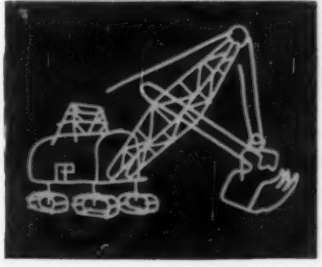


the more reason for using TIREX®

TIREX cords and cables give longest service when not subjected to severe abuse. But when required, TIREX can take it. In snow and mud, under water and under pressure, TIREX cords and cables remain flexible, smooth, light and easy to handle, thanks to their original cured-in-lead construction. They won't snag or tear, and their fortified and tempered neoprene armor gives balanced resistance to abrasion, water, acids, oils, sunlight and flame.

Millions of feet of TIREX are on the job everywhere—transmitting power for mobile mining equipment, construction machinery and portable tools.

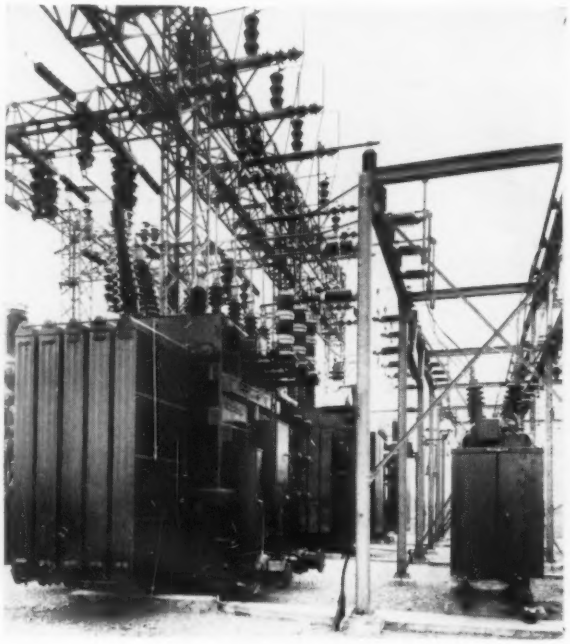




Simplex

LIVE BETTER ELECTRICALLY

WIRE & CABLE
COMPANY
79 SIDNEY STREET, CAMBRIDGE 39, MASS.



Inner-Cooled Transformer on Line; Aluminum Tank Revealed

Westinghouse Electric Corp has revealed two major transformer developments—the first installation of an inner-cooled 50-Mva unit and an aluminum tank for pole-type distribution units.

The inner-cooled transformer, first of its type, is operating on the New York State Electric & Gas Corp system. The unit is installed at the Hinman Road substation, Lockport, N. Y.

In the design, the oil is circulated between the strands of parallel conductors that are at the same potential. Materials are used that have higher insulation strength than oil where voltage stresses occur. In this manner, smaller, lighter and higher capacity units can be built to have the same design margins as the conventional construction.

This 30/40/50 Mva OA/FOA/FOA 115-kv transformer weighs 3.1 lb per kva, compared to 3.5 lb per kva for a similarly rated conventional unit.

The aluminum tank is the result of a joint development program by Westinghouse and Reynolds Metals Co. The most significant feature is the extruded aluminum fin-like sections in a variety of shapes for different purposes, according to A. W. Edwards, engineering manager for Westinghouse's Distribution Transformer Dept. He pointed out that some fins are deep thin sections for cooling; others are shallow and wide for bolting internal parts in place; still others are heavy parallel ribs, easily machined to provide a lifting slot in the outer wall. See above photograph.

A 25-kva aluminum transformer is now undergoing tests at the Sharon, Pa., plant before the new fabricating principles are extended to other ratings.

GE Has Order for 200-Mw Unit, to Ship in 2.7 Years

A 200-Mw turbine-generator has been ordered by New England Power Co from General Electric Co, Schenectady, N. Y. Shipment is scheduled for late 1961, or approximately 2.75 years.

The unit will be installed in the Brayton Point Station of the utility of the New England Electric System.

First of its type purchased by the utility, it will be a 3600/1800-rpm, cross-compound, double-flow reheat unit. Steam conditions will be 2400 psi, 1000/1000 F.

Both generators will be conventionally cooled with a combined capability of 260 Mva at 30 psi hydrogen and at 0.9 pf.

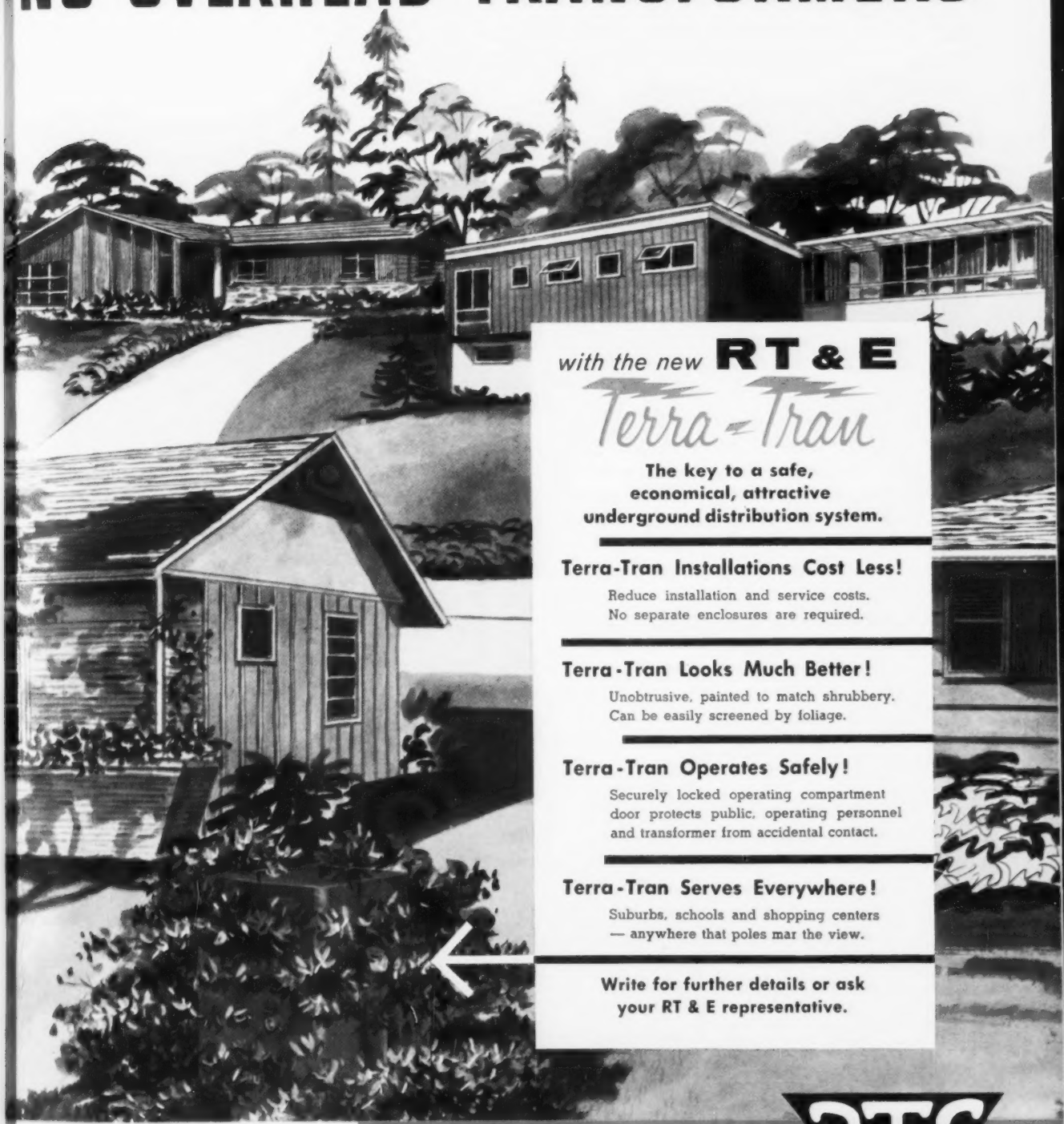
Alumoweld Production Up

Copperweld Steel Co's present plant facilities for the manufacture of Alumoweld wire and strand are being run at capacity, according to William W. Ege, vice president in charge of Copperweld's Wire & Cable Division.

New equipment, ordered in 1958, is scheduled for installation early this summer. The added facility will greatly increase the company's production capacity for the new type of conductor.

(*More Manufacturers News p* 70)

NO POLES NO EXPOSED LINES
NO OVERHEAD TRANSFORMERS



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Terra-Tran

The key to a safe, economical, attractive underground distribution system.

Terra-Tran Installations Cost Less!

Reduce installation and service costs. No separate enclosures are required.

Terra-Tran Looks Much Better!

Unobtrusive, painted to match shrubbery. Can be easily screened by foliage.

Terra-Tran Operates Safely!

Securely locked operating compartment door protects public, operating personnel and transformer from accidental contact.

Terra-Tran Serves Everywhere!

Suburbs, schools and shopping centers — anywhere that poles mar the view.

Write for further details or ask your RT & E representative.

ENGINEERING TALENT CONCENTRATED ON ONE IDEA
A BETTER TRANSFORMER

RT&E CORPORATION

WAUKESHA, WISCONSIN • PORTLAND, OREGON

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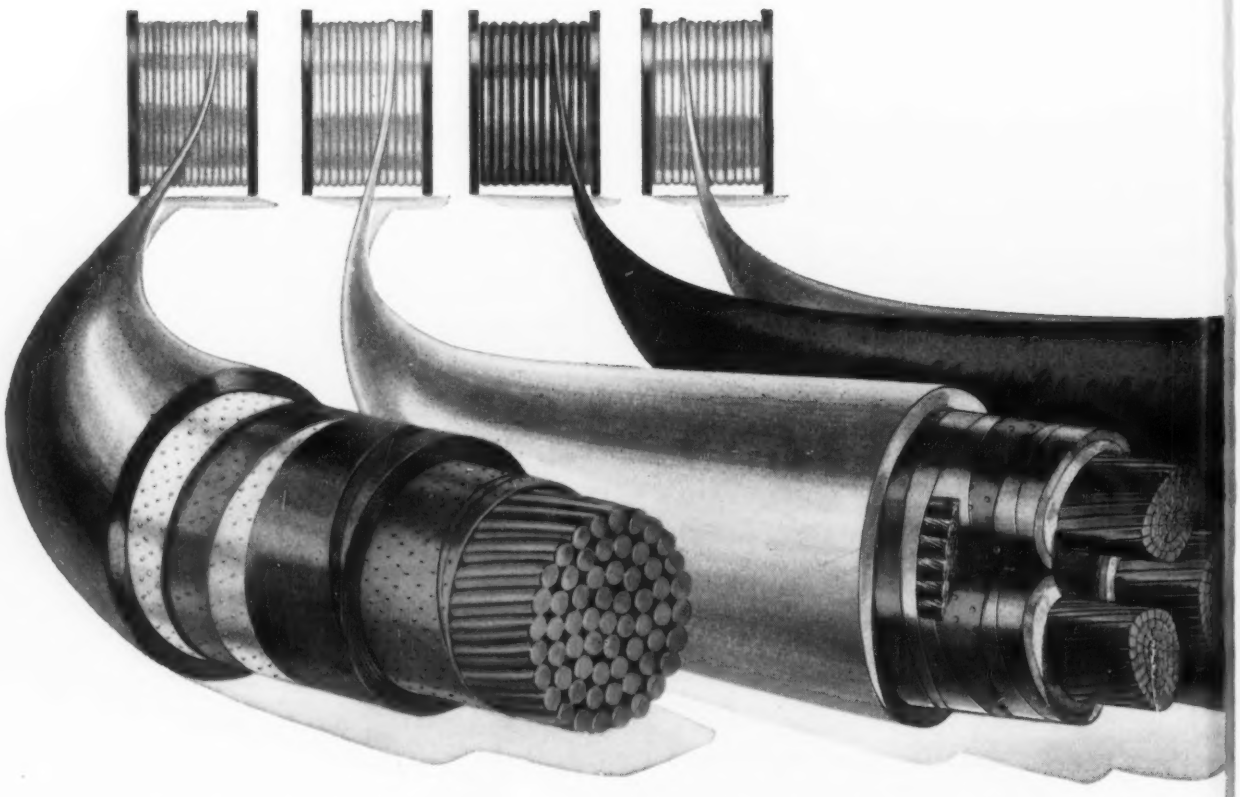
FOR THE MOST EFFICIENT
POWER DISTRIBUTION . . . SPECIFY

PAPER-INSULATED CABLES BY PHELPS



Single conductor, 1 KV and up

Three-conductor, 1 KV and up

DODGE!

Phelps Dodge paper-insulated power cables have a *demonstrated record* of long life in a great variety of designs for all types of applications—underground duct, direct burial, submarine and aerial.

Paper-insulated cables have these important inherent characteristics that improve operating performance and lengthen service life:

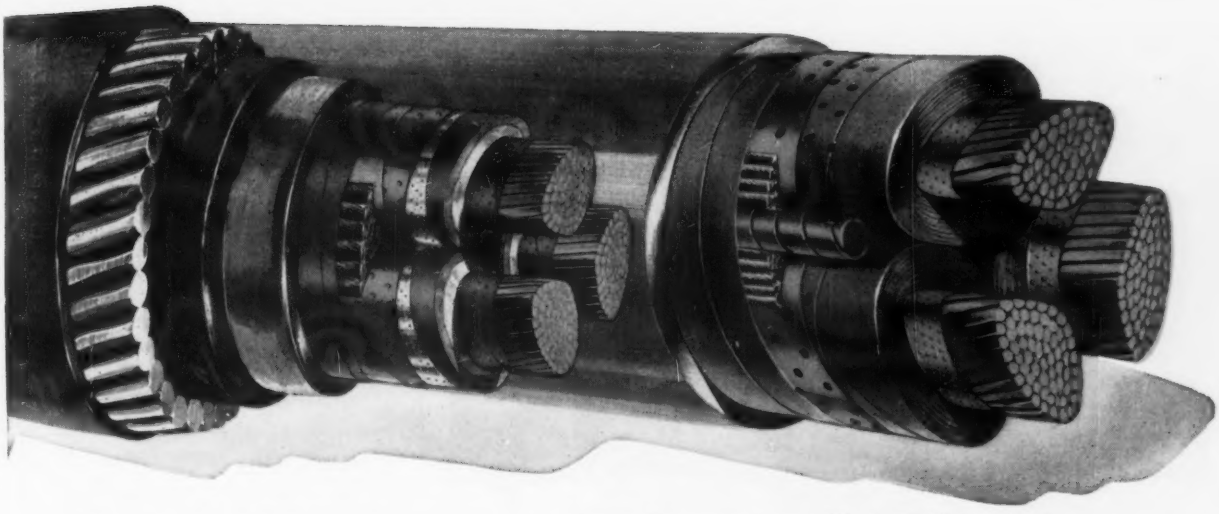
- Extra high 60-cycle and impulse strength to withstand switching and lightning surges.
- Ability to handle large blocks of power in single cables of minimum dimensions.
- Positive protection against all contaminations, due to being hermetically sealed in an extruded metallic sheath.

Paper-insulated cables can be supplied with either lead or aluminum sheaths.

Phelps Dodge offers the widest range of high voltage cables to the electrical industry.

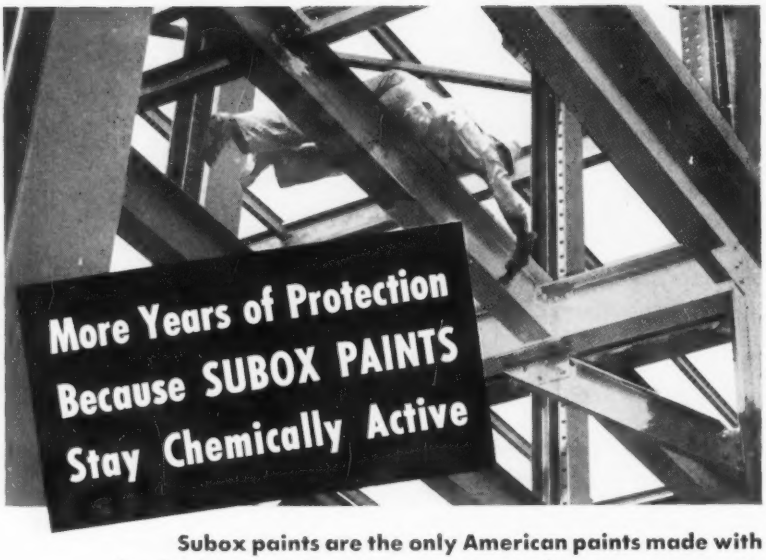
PHELPS DODGE COPPER PRODUCTS CORPORATION

300 PARK AVENUE, NEW YORK 22, NEW YORK

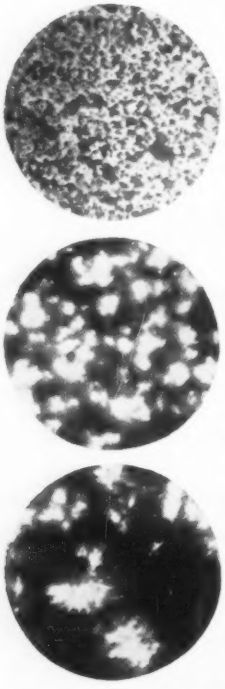


Submarine, 1 KV and up

Low-Pressure gas-filled, 8 KV and up



Subox paints are the only American paints made with lead-suboxide. They give extra protection at no extra cost.



Dark areas in above photomicrographs show how pigment increasingly intertwines to form dense, protective film.

SMALL PARTICLES PENETRATE SURFACE

Maximum penetration is achieved because lead-suboxide is a colloidal pigment. Its film is so dense and impervious that two coats of Subox usually equal three coats of other paints . . . often one coat of Subox is sufficient.

CHEMICALLY-ACTIVE METALLIC FILM

Lead-suboxide remains chemically active after Subox paint dries. It reacts with the fatty acids of the vehicle to form insoluble lead soaps, and builds up a reinforced protective film of intertwining metal-bearing fibers.

FIBROUS COAT IS STRONG ADHESIVE

The fibrous film of Subox gradually strengthens and replaces the original vehicle film (which otherwise would become brittle), and creates a strongly adhesive protective coating with an inherently longer life than that of other paints.

In addition to its other advantages and economies, Subox also saves on eventual repainting. The need for expensive scraping and repriming is largely eliminated.

Available in wide color range. Write for color card and the brochure "Subox Paints".

SUBOX PAINTS

Subox Inc.

Established 1924
3 Fairmont Plant
Hackensack, N. J.

Detroit Edison Unit Hits Record Output

A single steam-electric generating unit attained a new high in capacity for electrical output recently. Detroit Edison Co's River Rouge Unit No. 3 produced power at a rate in excess of 340,000 kw for about 24 hr.

All major equipment exceeded design capacities. The turbine-generator, designed and built by Allis-Chalmers Manufacturing Co, developed 341,000 kw although its nameplate rating is 320,000 kw. It was supplied with 2,300,000 lb of steam per hr from a single Foster Wheeler Corp natural-circulation steam generator designed for 2,000,000 lb per hr, 2725 psi and 1050/1000 F. Heat rate of Unit No. 3 is 8620 Btu per kwhr.

Delta-Star to Supply Three High-Capacity Buses

Orders for three isolated-phase, metal-enclosed buses, reportedly the largest to be installed in this country, are being filled by Delta-Star Electric Division of H. K. Porter Company, Inc.

Latest order is for Commonwealth Edison Co's Crawford Unit No. 8. This bus run is the largest capacity, rated 11,300 amp from the high-pressure unit, and 9,200 amp from the low-pressure unit.

A switching scheme as part of the bus enables the utility to connect the generator either to the h-v transformer or to the 12-kv bus at Crawford. An alternative scheme ties the transformer to the main bus but with the generator disconnected.

Other two orders include an 11,000-amp rated bus for Indiana & Michigan Electric Co's Breed Station, and a 10,000-amp rated bus for Ohio Power Co's Philip Sporn Unit No. 5.

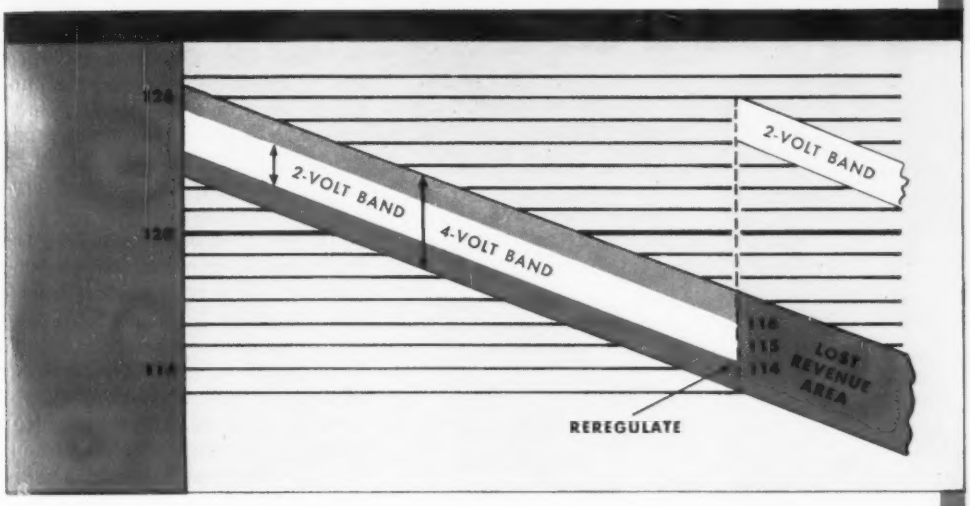
Single-Pole Reclosers Protect 46-Kv Lines

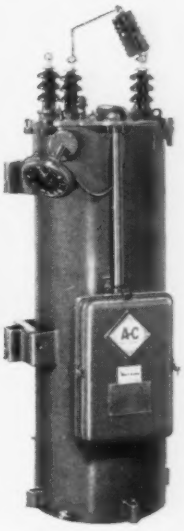
Two 46-kv single-pole automatic circuit recloser installations—believed the first of their kind in the U. S.—were recently put into serv-

(*Continued on page* 72)

ALLIS-CHALMERS — 25 years of 5/8% Regulator Leadership

Losing revenue?





NATIONAL ELECTRICAL WEEK
FEBRUARY 8-14, 1959

Here are 4 steps to increased revenue!

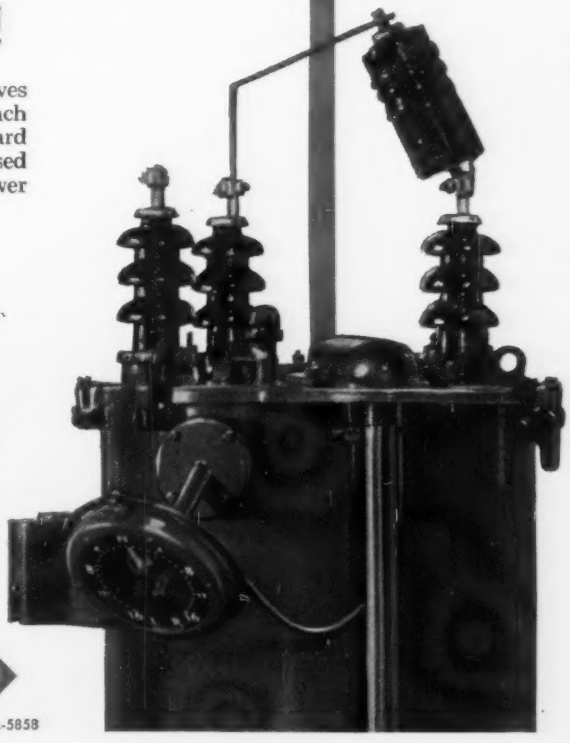
"Engineered regulation" provides added revenue — improves service while cutting regulation cost as much as 50%. Each single volt increase in average voltage on a feeder (toward the optimum) means $1 per customer per year increased revenue. At the same time "engineered regulation" is lower cost regulation.

Four basic steps are:

1. **Cut band width to two volts.**
2. **Reregulate feeders.**
3. **Use low-cost 5/8% step regulators.**
4. **Engineer to *fully* utilize *Vari-Amp*.**

Allis-Chalmers leadership and engineering experience are ready to help you work out a four-step regulator program.

Contact your nearby Allis-Chalmers office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.



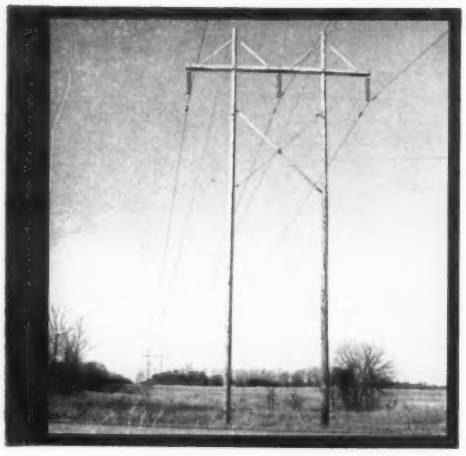
Originators of 5/8% Step Regulators

ALLIS-CHALMERS

Vari-Amp is an Allis-Chalmers trademark.

A-5858

GALVANIZED STEEL STRAND

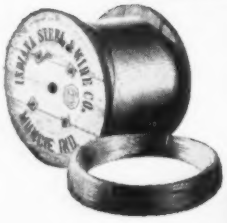


YOUR ASSURANCE OF HIGH QUALITY, LONG LIFE AND LOW COST

Close laboratory control over each step in manufacture has established Crapo Galvanized Steel Strand as a product of highest quality and dependability. You benefit through longer service life and lower ultimate costs.

Heavy, uniform, tightly-bonded coatings of commercially pure zinc, applied by the famous Crapo methods, withstand the punishment of construction, provide maximum resistance to corrosion and contribute to over-all economies.

For OVERHEAD GROUND WIRE . . .
CRAPO Weldless Galvanized Steel Strand



The most practical and economical strand for shielding transmission lines against lightning. Maximum strength and high fatigue endurance, inherent in Crapo Weldless Strand, provide that extra safety factor so important in overhead ground or static wire.

For GUYS and MESSENGER . . .
Crapo Galvanized Steel Strand. Made to highest standard specifications . . . a size and breaking strength to meet all practical needs.

Contact your jobber or write for descriptive folder.

INDIANA STEEL & WIRE CO., INC.
Muncie, Indiana

Single-Pole Reclosers . . .

(*Continued from page 70*)

ice on subtransmission lines of Consumers Power Co.

The reclosers, built by Greensburg Division of I-T-E Circuit Breaker Co, protect lines that had relatively high interruption records because of age, type of construction, and severe storm conditions. The lines, 3-phase grounded-wye, supply rural and urban loads primarily.

Low installation cost was particularly important in one of the recloser facilities. The units were mounted on existing poles, obviating the purchase of expensive land. Three group-operated air switches permit bypassing and isolating the three reclosers for maintenance and service.

At the other installation, the reclosers were mounted on foundations at ground level inside a fenced area. They are protected from voltage surges by rod gaps.

The self-contained reclosers make installation easy because they require no external power or control relaying. Tripping and reclosing are accomplished by built-in controls and operators.

Line of Ultrasonic Welders Designed by Aeroprojects

Aeroprojects Inc, a research organization of West Chester, Pa., has developed ultrasonic welding with automatic timing for production use. Basic unit includes a high-frequency generator and metal-joining apparatus.

Latest equipment is a portable-head spot-type welder (2 kw, 20-28 kc) for welding materials such as used in truck cab bodies. A small production unit is a spot-type bench welder (100 w) to join different metals such as 0.002 in. aluminum wire to 0.005 in. silicon connected on copper strip, also join thin foil materials.

NDA Solves Water-Sodium Separation Problem

Barrier and structural materials for the Sodium Deuterium Reactor are being tested in the experimental setup at Nuclear Development Corp

of America's 1200-acre Pawling, N. Y., laboratory. The 10-Mw SDR is being designed by NDA for the Atomic Energy Commission. It will be linked to the Chugach Electrical Association's system in Anchorage, Alaska.

Test results indicate the barrier tube arrangement proposed for the SDR appears adequate for maintaining separation of simultaneous sodium and water leaks until they are detected and corrective action applied.

In addition to its test facilities for SRD, NDA has the only industrial privately owned heavy water research reactor at its Pawling site. It went critical Nov. 5, 1958.

MANUFACTURERS BRIEFS

Dow Chemical Co has developed a new epoxy resin for applications requiring greater heat resistance and heat stability. It is called epoxy novolac and is based on epichlorohydrin and novolac. Typical uses are in hign strength adhesives for metal fabricating, and in glass reinforced laminates for structural shaped and printed circuits.

S. Morgan Smith Co, York, Pa., has been acquired by Allis-Chalmers Mfg Co, Milwaukee, Wis., in exchange for A-C common stock. SMS facilities become A-C's hydraulic turbine division. Beauchamp E. Smith, president of the Smith Co has been appointed general manager of the hydraulic turbine division.

Federal Pacific Electric Co, Newark, N. J., has acquired Economy Fuse and Mfg Co, which maintains plants in Chicago and Palatine, Ill. Capital assets and subsidiaries of Economy will be exchanged during this month for 97,750 shares of Federal Pacific common stock. Economy's Montreal subsidiary will be combined with FP's recently formed complete-line Canadian organization.

Leeds & Northrup Co has received a $60,251 contract from Southwestern Electric Power Co for general instrumentation, panels, and automatic combustion control equipment. The equipment will be installed at Arsenal Hill Station.

SHAWMUT'S
TIME-TESTED
SILVER-PLATED
Tri-onic
(Dual-Element)
The General Purpose Fuse

*Interrupting Capacity
25,000 Amps. A.C.

KEEPS MOTOR
CIRCUITS SAFE

This is the first low voltage fuse with a published interrupting capacity of 25,000 Amps. (15,000 Amps. more than required by U.L. Standard for fuses.) For real protection use it in place of all ordinary types of fuses.

TRI-ONIC* GIVES
3-WAY PROTECTION

1. **HIGHER INTERRUPTING CAPACITY.** 25,000 A. @ 250 V & 600 V. Handles short-circuits 2½ times larger than ordinary fuses. Expands fuse application into 25,000 Amp. zone. Use it on bus plug-in duct, bus-ways, feeders, motor control panels, branch circuits.
2. **LONG TIME-DELAY.** Safely starts heavily loaded motors without blowing. Prevents circuit "outage" caused by heavy motor-starting currents or load swings. Provides "matched" protection for your motors.
3. **COOLER OPERATION.** Runs cool because of silver-plating and low I²R losses throughout. Opens at 286° F. or 500° lower than ordinary zinc links. Ideal for distribution and panel boards, motor branch circuits, knife and enclosed switches.

* U.S. Patent Nos. 2,111,749 – 2,300,620 2,321,711

Insist on TRI-ONIC.
Ask for TRI-ONIC Bulletin today.

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Tri-onic – "Awake At The Switch"
THE CHASE-SHAWMUT CO.
374 MERRIMAC STREET • NEWBURYPORT, MASSACHUSETTS
Subsidiary of I-T-E CIRCUIT BREAKER CO., Philadelphia, Pennsylvania
Est. 1893

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Helping the power industry grow

Skilled construction men and giant ceramic insulators in a high voltage substation harnessing the enormous power that serves homes and industries. Painting by Stanley Meltzoff.

The Economy of Experience

Operating within established budget limits in the design and construction of a power project, large or small, calls for experience of the highest order. Only this can effect cost and timesaving advantages — and still assure the smooth teamwork needed in design, purchasing, expediting and construction.

Making experience pay dividends to the client has been demonstrated on such projects as design and construction of hydroelectric and thermal plants and responsibility for installations that supply heating and process steam.

Let our skills and creativity augment the engineering facilities of your organization. Put to your service the advantages offered by United Engineers, with its 75 years' experience.

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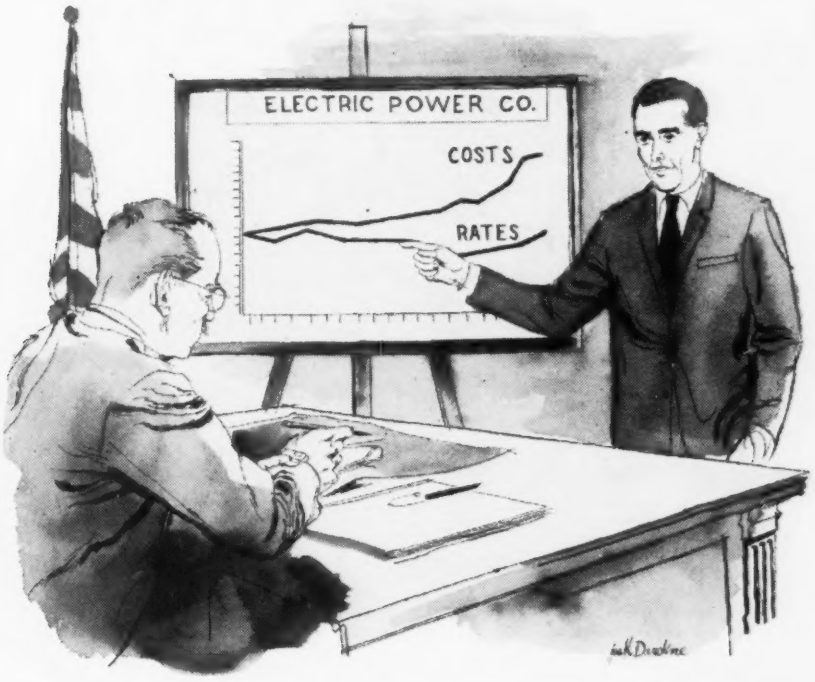


Report on
Rates and Regulation

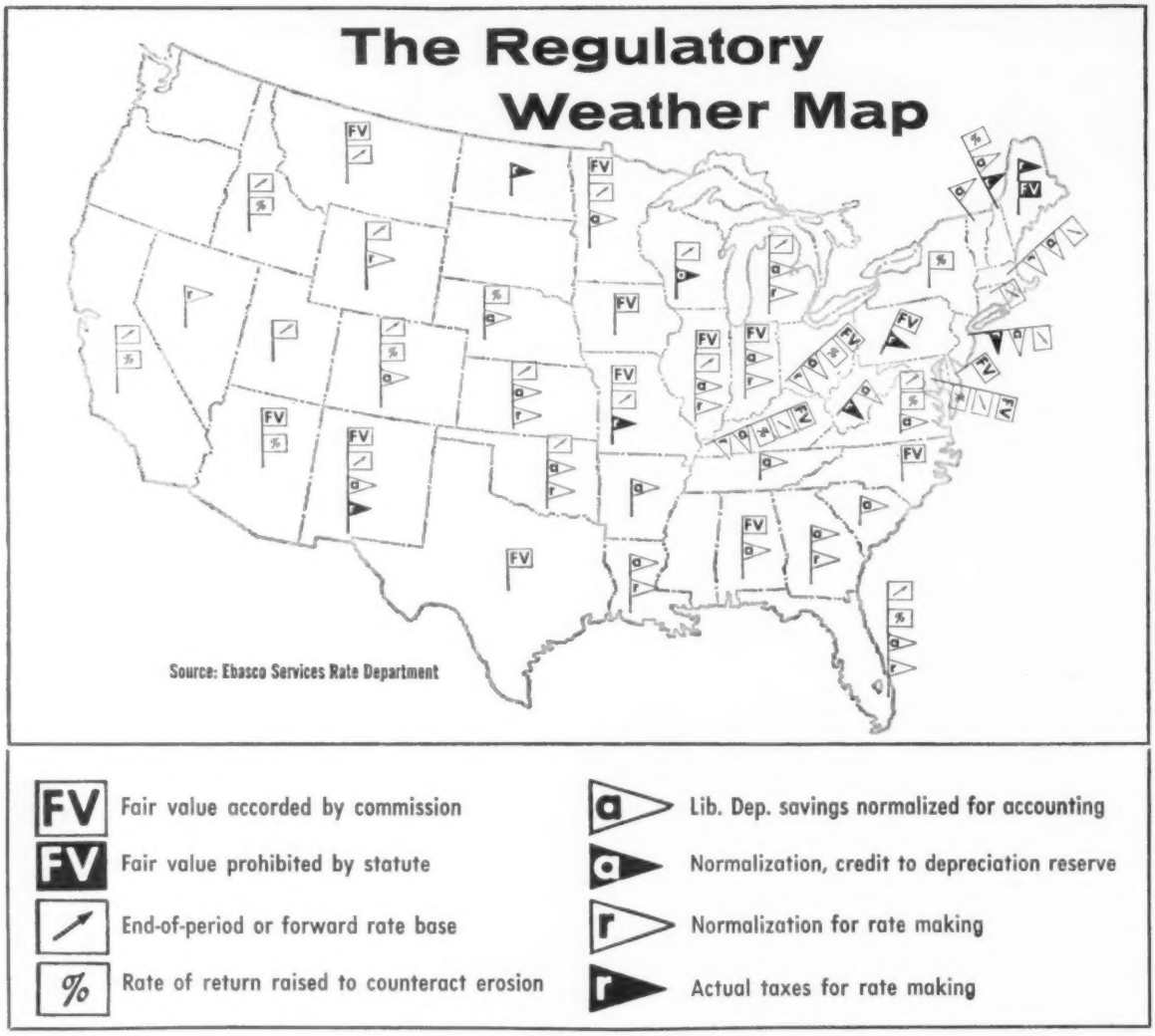
Hard Look at Regulatory Climate

"There must be an improvement in the broad field of regulatory relations," Robert S. Quig, manager of Ebasco Services' Rate Department, told the New York Society of Security Analysts late last month. Regulatory authorities must be convinced that the tremendous future growth in utility service can be financed only if the utilities are able to earn an adequate rate of return, said Quig. He gave the analysts an up-to-the-minute picture of the regulatory climate in each of the states, and outlined trends in ratemaking.

The fair value principle is today prohibited by law in only one state, Quig said. Wording of other state laws ranges all the way from "shall consider evidence of present value" through "may consider evidence of present value" to "shall consider every fact which in its judgment may or does have any bearing on such value." Only Maine has legislation prohibiting demonstration of fair value.

But fair value has not been so popular with the commissions. Many have quoted the Hope decision, involving a natural gas pipeline under a federal statute, as a basis for establishing an original cost depreciated rather than a fair value rate base—even though their state statutes prescribe a form of fair value. After the Hope case, many decisions thus disregarded the basic legal rights of the utilities. Yet few utilities dared to take the commissions to court.

The courts have shown less hostility to fair value than the commissions. In reaffirming a state law calling for fair value, the Montana Supreme Court put it succinctly: "The Hope case is not binding upon the Public Service Commission of Montana. Its actions must square with the Montana statutes and the decisions of this court." Where commissions or city bodies have failed to grant fair value in accordance with the statutes, several state courts have reversed them. Among ten such cases in the last three years, the Supreme


The Regulatory Weather Map
Source: Ebasco Services Rate Department
FV Fair value accorded by commission
FV Fair value prohibited by statute
End-of-period or forward rate base
% Rate of return raised to counteract erosion
a Lib. Dep. savings normalized for accounting
a Normalization, credit to depreciation reserve
r Normalization for rate making
r Actual taxes for rate making

Court of Iowa minced the least words in its opinion on the gas rate case between Iowa-Illinois Gas & Electric Co and the City of Fort Dodge: "The arguments against fair value are all ones of expediency, not ones of justice or fundamental fair treatment."

Utilities today are being accorded fair value treatment in 16 states. The map above shows the regulatory climate—state by state—as to fair value and other regulatory concepts. Many commissions have recognized the realities of inflation by using a "forward rate base" approach. No less than 21 state commissions have used end-of-period rate bases and have in some cases projected rate bases at least six months ahead. By allowing recent or projected plant additions in the rate base, this approach does give the utilities immediately needed revenue. But it does not develop a single dollar of fair value for all plant dollars that have been committed at lower price levels.

Another twelve states have added a fraction of a percent to the rate of return in order to counteract the erosion of return as prices keep rising. The California PUC recently authorized General Telephone Co to increase rates based on a 7.1% initial return (on a forward original cost rate base) although they found a 6.6% rate reasonable. The commission felt that rising costs would whittle down the initial 7.1% rate of return to an average of 6.6% over the period. Other

states which have tried in varying degrees to overcome this erosion due to regulatory lag are shown on the map. While Quig acknowledged these ideas as sincere attempts to allow utilities an adequate return, he urged all utilities to include proof of fair value in their rate case presentations.

The stormiest present regulatory issue is how to treat liberalized depreciation. Under Section 167 of the Internal Revenue Code of 1954, industrial and utility taxpayers are permitted to apply the sum-of-the-years-digits or the declining balance method of depreciation to facilities built after Dec. 30, 1953 in computing federal income tax liability. When regulated utilities elect to use liberalized depreciation, how is it to be handled for rate making purposes?

Regulatory treatment of this controversial item falls into two categories: First, the orders that have been issued in the states directed at accounting procedure. Second, and more important, actual rulings in rate cases.

For accounting, five states[1] have either authorized specific utilities or directed all utilities to normalize taxes and to use a restricted or appropriated surplus method in recording the tax deferral. Fourteen states[2] have ordered the normalization of taxes and prescribed a tax reserve method. Five other states[3] have permitted, upon application by specific companies, the normalization of taxes and the use of either method.

The Wisconsin PSC has approved an accounting method which differs substantially from the techniques adopted by the other state commissions. Wisconsin provides for a charge to depreciation expense and a credit to depreciation reserve (in addition to depreciation computed on a straight line basis) equal to the reduction in federal income taxes resulting from the use of liberalized depreciation.

For rate making, seven states[4] have permitted full normalization of taxes. In these states normalized taxes have not only been allowed as an expense, but have been left in the rate base. Six more states[5] have allowed taxes to be normalized, but have either deducted the tax reserve or restricted surplus from the rate base or have considered this amount as interest-free capital in determining rate of return. Eight states[6] have ordered use of actual taxes.

Three state courts have sustained their commissions' rulings. The Hendrix County Circuit Court upheld the Indiana Commission in its order permitting normalization, while the Supreme Courts of Maine and Pennsylvania have sustained commissions ordering the use of actual taxes.

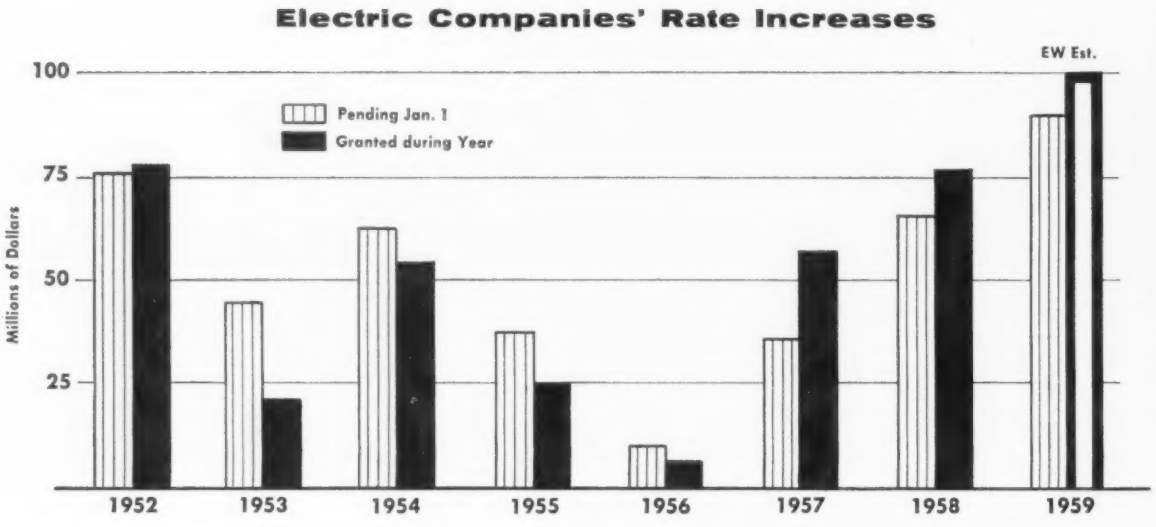
The intent of the U. S. Congress in enacting Section 167 was stated plainly in reports of the House Ways and Means Committee and the Senate Finance Committee: ". . . The faster tax writeoff would increase available working capital and materially aid growing businesses in the financing of their expansion. For all segments of the American economy, liberalized depreciation policies should assist modernization and expansion of industrial capacity, with resulting growth, increased production, and a higher standard of living."

In spite of this clear statement of intent, there has been some agitation to compel utilities to pass on all benefits directly to the rate payers. The California PUC is now holding hearings to determine whether or not utilities in the state will be deemed to have taken liberalized depreciation when in fact some of them may not have taken it (EW, Nov. 3, 1958, p 95; and Jan. 12,

1 Alabama, Colorado, Florida, Virginia, and West Virginia.
2 Arkansas, Georgia, Illinois, Indiana, Kansas, Louisiana, Massachusetts, Minnesota, Nebraska, New Hampshire, New Mexico, Ohio, Tennessee, and Vermont.
3 Kentucky, Michigan, New Jersey, Oklahoma, and South Carolina.
4 Florida, Indiana, Louisiana, Massachusetts, Nevada, Oklahoma, and Wyoming.
5 Georgia, Illinois, Kansas, Kentucky, Michigan, and Ohio.
6 Maine, Missouri, New Hampshire, New Jersey, New Mexico, North Dakota, Pennsylvania, and West Virginia.

1959, p 91). The Maine PUC ruled Dec. 30, 1958 that Bangor Hydro-Electric Co's revenue requirements should be computed to reflect the use of liberalized depreciation "even though the company elects to pay a higher tax than it is liable for." In dissenting from this ruling, Commissioner Allen said: ". . . It is unwise for this commission, at this time, to enter openly into an area which is a prerogative of management and management alone." And the Pennsylvania Supreme Court recently upheld Manufacturers Light & Heat Co's right to use straight-line tax depreciation with the words: "We do not believe . . . that it would be proper to require, as a matter of law, this utility or any other utility to use a particular method of depreciation in computing the federal income tax allowance when the law permits use of any of several methods."

Commissions generally are coming to realize that utilities must raise rates to keep up with rising costs. Rate structures are properly being allowed to include rates promotional enough to sell new customers while still giving adequate investment protection. At the same time, more emphasis is being placed on fuel clauses, tax clauses, and other means of automatic escalation in order to provide prompt and effective regulation.



During 1958 electric utilities received some $76 million in rate increases. At the end of the year, however, there were still some $92 million of electric rate increases pending. Costs are still rising. It is clear that utilities have much work ahead of them in showing the commissions that rate increases sought are in the customers' ultimate interest. Quig summed up the job ahead:

"The primary mission of the utility industry is to render adequate service to its customers at just and reasonable rates. To help accomplish this mission, management has the continuing responsibility of keeping the regulatory authorities adequately informed as to the financial and economic requirements of the utility. Management would be derelict in its duty both to customer and investor if it did not initiate rate adjustments which are required to maintain adequate service. The regulators, on their part, need to consider their responsibilities from a more objective point of view, and formulate workable policies founded on good law and sound economics. The commission staffs need to give more attention to . . . 'the Big Picture' and 'to stop making a fetish of accounting,' as the late Mr. Justice Jackson termed it in the Hope case decision.

"In the long run, it will be in the customer's interest to pay some additional pennies per day in order to secure for the utility the financial stability and operating capability essential for proper discharge of its public responsibilities."

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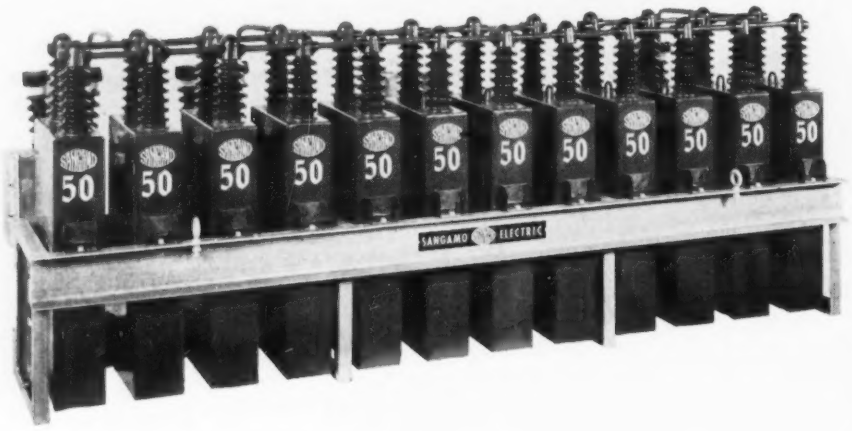

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Sangamo Electric Co, Springfield, Ill.

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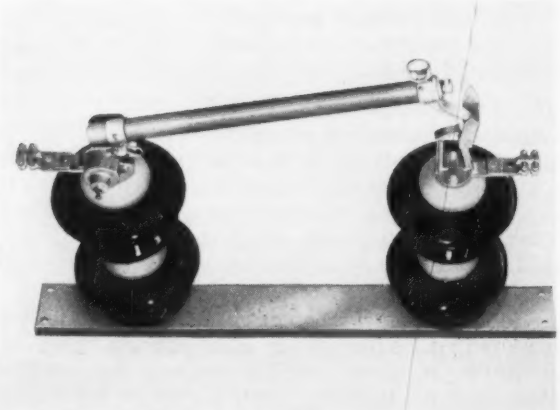
. . . are available on network transformers. Made of alumina, the bushings have a tensile and compressive strength more than five times that of porcelain. The new bushings permit lowering the transformer throat, reducing the overall height of the transformer-protector combination. Welding eliminates the need for bulky clamping structures, and the new bushing is entirely within the throat and does not extend into the tank.
General Electric Co, Schenectady 5, N. Y.

Power Fuses . . .

. . . offer full range of protection from 7.5 to 161 kv. Three types are available: Type BP heavy duty, with ratings from 7.5 to 69 kv, 100 and 200 amp; Type MP extra-heavy duty, with ratings from 46 to 161 kv, 100 and 200 amp; and Type HP extra-heavy duty, with ratings from 7.5 to 69 kv, 300 and 400 amp. They employ expendable caps and boric acid arc-quenching fuse element construction. Type MP is shown.
Southern States Equipment Corp, Hampton, Ga.

(More New Equipment on page 82)



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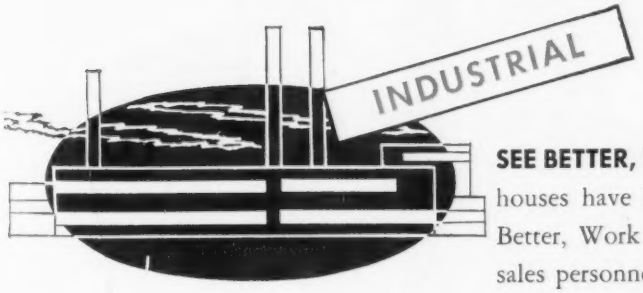

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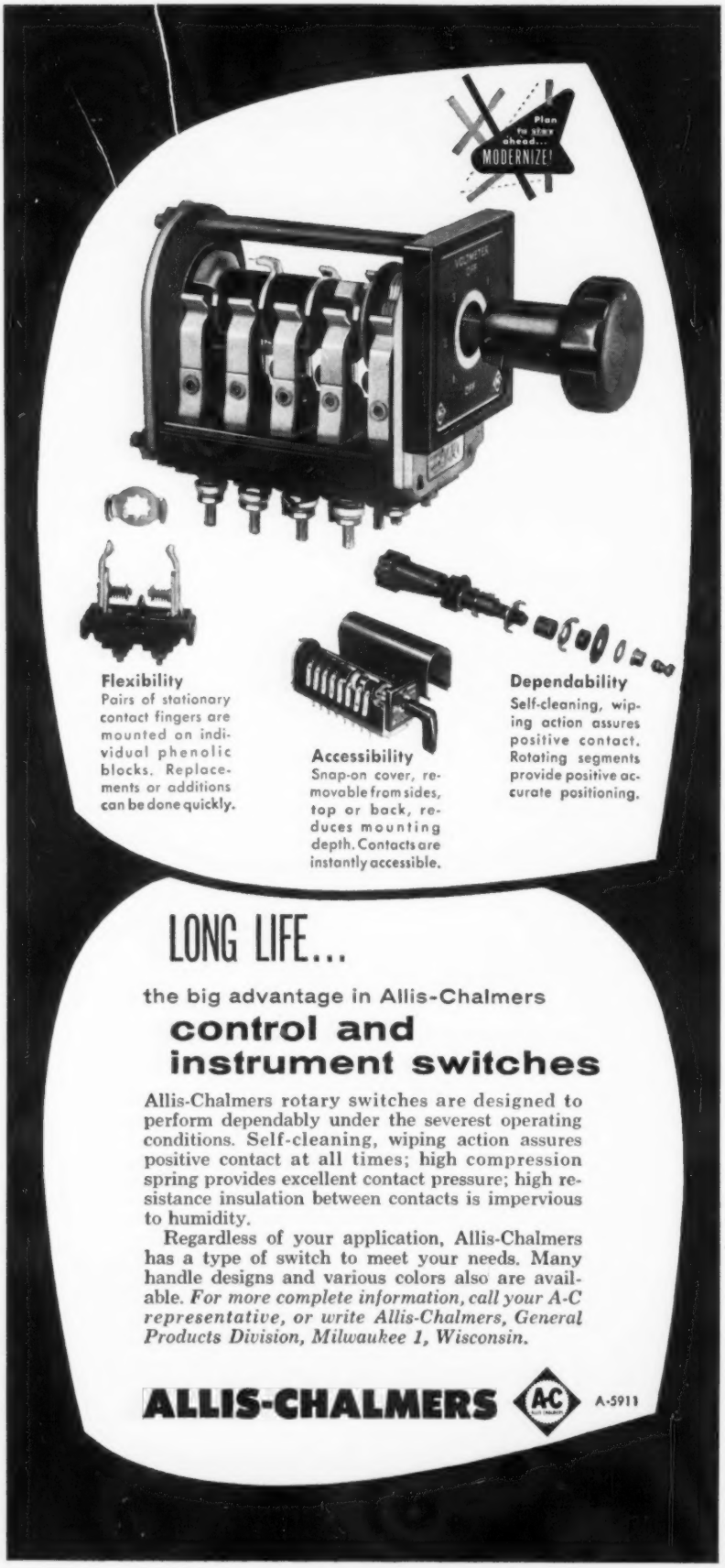
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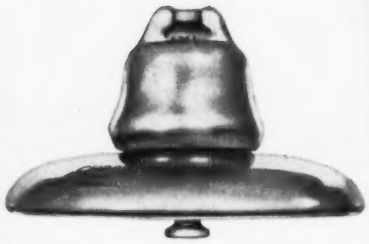

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. . . with NEMA gray glaze are now available. The gray glaze distinguishes 25,000-lb ball-and-socket insulators from standard, brown-colored, 15,000-lb insulators. Identification is certain and easy, and the possibility of coupling insulators of different strengths into the same string is eliminated.

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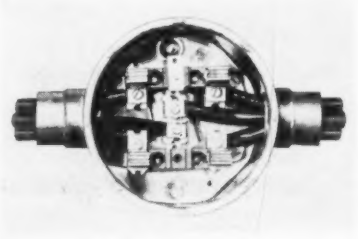
Oil Switches . . .

. . . in a full line are now available. The ESCO Load Break Oil Switches are offered as 2, 3 or 4-way, 3-pole in 7.5 and 15-kv, 400-amp ratings. Tanks are of ¼-in. welded steel, pressure tested. All component parts are of standard design, interchangeable within like ratings, and include provisions for padlocking, key and electrical interlocking. Stationary, link, and floating contacts are silver plated.

ESCO Mfg Co, Box 1039, Greenville, Tex.



Meter Socket . . .

. . . has open top 1/0 connectors. The Octagonal Meter Socket also features single or double neutral, two or three hubs from ¾ in. through 2 in. conduit sizes, and deep drawn and expanded aluminum can for greater room. The socket is UL approved for 100-amp, 600-v operation.

Anchor Mfg Co, Manchester, N. H.

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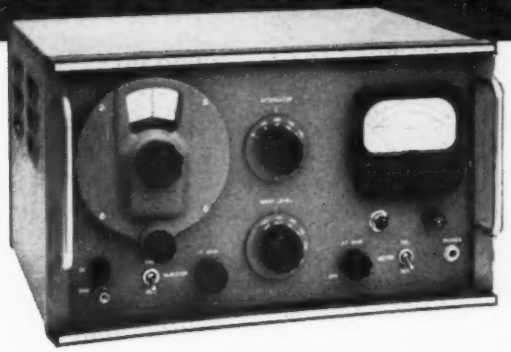
for wave analysis, wire carrier and microwave subcarrier measurements



Sierra 121A Wave Analyzer is a double superheterodyne receiver covering 15 KC to 500 KC. It provides data directly in volts and dbm at 600 ohms, and offers high selectivity required for single sideband carrier measurements.

Sierra 158A Wave Analyzer is similar to Model 121A but covers 500 KC to 10 MC.

Both instruments have ±2 db accuracy, spurious response at least 50 db down, and signal measurement range of 77.5 μv to 97.5 volts. Available for either cabinet or relay rack mounting.

Frequency-selective carrier-frequency voltmeters

For carrier frequency and other field or laboratory work between 3 KC and 800 KC, Sierra offers five accurate, stable tuned vacuum tube voltmeters. All are direct reading in voltage and dbm at 600 ohms from —80 dbm to +42 dbm. All feature built-in calibration oscillators, level calibration circuits, aural monitoring jacks, and (except 103B) precision spiral scale dials. All are ruggedly constructed of quality components for long operating dependability.

SPECIFICATIONS — SIERRA VOLTMETERS

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		Down 3db	Down 45db	Frequency	Measuring	Balanced	Unbalanced
101C	20-500	± 550 cps	± 2900 cps	Note A	± 3 db	Note D	600 ohms
103B†	3- 40	± 400 cps	± 3000 cps	± 0.5 kc	± 3 db	Note D	600 ohms
104A	5-150	± 300 cps	± 1500 cps	± 1 kc	± 3 db	Note D	600 ohms
108B	15-500	± 550 cps	± 2900 cps	± 3 kc Note B	± 2 db Note C	135 ohms Note D	600 ohms
114A	100-800	± 550 cps	± 2900 cps	Note A	± 3 db	Note D	600 ohms

† Contains carrier re-insertion oscillator for monitoring suppressed carrier systems. Furnished with planetary drive dial. Note A. Ranges from ± 2 KC at low end of dial to ± 3 KC at upper end. Note B. ± 1 KC in the 48 KC to 256 KC region. Note C. ± 1 db for + 30 db to —40 db attenuator steps on 135 ohm balanced measurements. Note D. All models may be converted for 135 and 600 ohm balanced line measurements by convenient plug-in bridging transformer, Model 130D.

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FEBRUARY 9, 1959

Memphis Elects Top Officers

MORTON

WADE

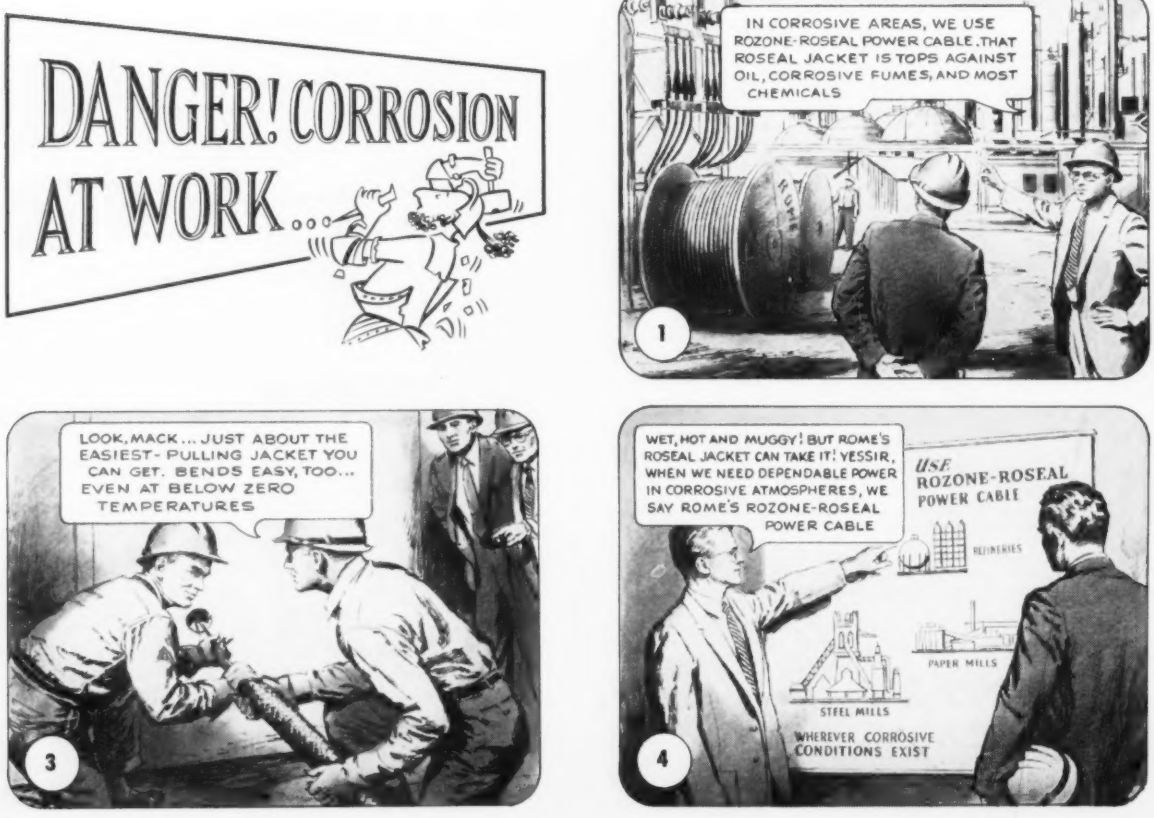
James Ray Morton has been elected president of the Memphis Light, Gas and Water Division, succeeding the late Thomas H. Allen. Neander W. Wade has been appointed vice president. Both appointments are until June 1, 1960.

Morton had been vice president since 1955. He joined the division in 1938 after graduation from the University of Tennessee. Starting as a junior engineer, he later served as assistant to the design engineer, design engineer, primary engineer, assistant substation design engineer, chief substation engineer, and system engineer.

He is a member of the American Institute of Electrical Engineers and the Tennessee Valley Public Power Assn, and a director of the American Public Power Association.

Wade joined the division in 1922 to make a study of stores inventory and cost accounting. The next year he transferred to the Accounting Department in charge of general accounting. From 1926 to 1935, he was in charge of the financial affairs, accounting, and administrative work.

He was then appointed secretary to the Board to act as treasurer, financial officer and director of the Accounting and Business Administration of the division.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IN CORROSIVE AREAS, WE USE ROZONE-ROSEAL POWER CABLE. THAT ROSEAL JACKET IS TOPS AGAINST OIL, CORROSIVE FUMES, AND MOST CHEMICALS
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LOOK, MACK... JUST ABOUT THE EASIEST-PULLING JACKET YOU CAN GET. BENDS EASY, TOO... EVEN AT BELOW ZERO TEMPERATURES
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WET, HOT AND MUGGY! BUT ROME'S ROSEAL JACKET CAN TAKE IT! YESSIR, WHEN WE NEED DEPENDABLE POWER IN CORROSIVE ATMOSPHERES, WE SAY ROME'S ROZONE-ROSEAL POWER CABLE
USE ROZONE-ROSEAL POWER CABLE
REFINERIES
PAPER MILLS
STEEL MILLS
WHEREVER CORROSIVE CONDITIONS EXIST
4

A&FP Elects Two Presidents

American & Foreign Power Co Inc has elected presidents for two of its foreign affiliates. R. Vaughan Sear is the new president and general manager of Empresas Electrica de Guatemala, and M. Claire Titus has been named president and manager and a member of the board of directors of Cia. Anonima Luz Electrica de Venezuela.

Sear, who resigned as vice president of employee relations of Ebasco International Corp, has succeeded Stephen A. Hammond, Jr., who will join the corporate secretarial department of Ebasco International. Titus, who relinquishes his duties as assistant to the president of American & Foreign Power Co, has succeeded Rudolph T. Lucke who retired.

SEAR

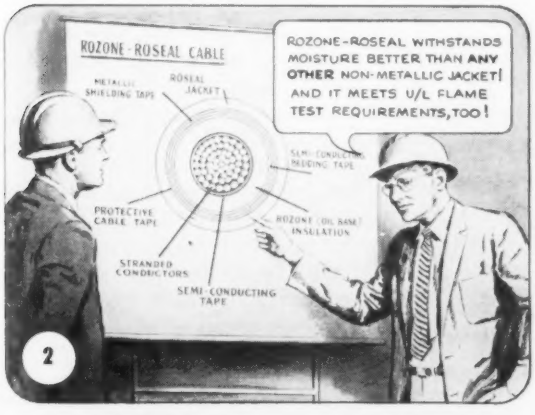
TITUS

Dohr Named VP at Moloney Electric

Moloney Electric Co has promoted J. M. Dohr to vice president in charge of production. Formerly manager of the power production department, he replaces C. G. Duenke who has started his own firm.

Dohr has been with Moloney for 31 years, working in the manufacturing, engineering, and production departments.

In his new position, he will be responsible for the operation and management of the power, distribution, and electronic transformer production departments.



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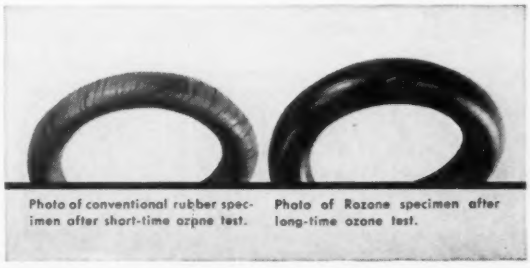

Photo of conventional rubber specimen after short-time ozone test. Photo of Rozone specimen after long-time ozone test.

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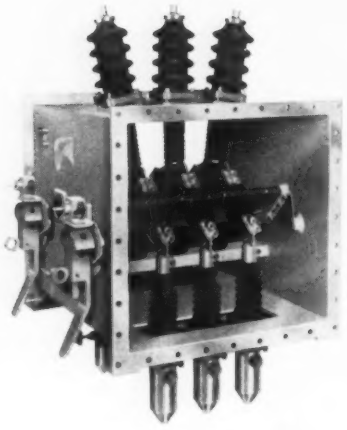

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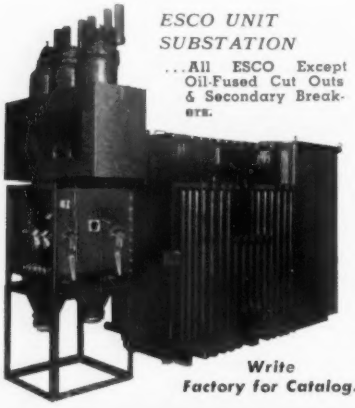

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PERSONAL BRIEFS

William R. Brownlee has been appointed power pool manager for Southern Services, Inc, and will be responsible for coordinating the power supply operations of the Alabama, Georgia, Gulf and Mississippi Power Companies, and the Southern Electric Generating Co of the Southern Co system. **F. G. Hamner** has become system planning engineer, responsible for planning, studies, and analysis of special problems relating to transmission and distribution system additions and improvements; **N. F. Williams,** assistant to the president, will act as consultant on foundation problems and hydro projects; **O. E. Charlton** has become system electrical engineer and will coordinate the work of the System Planning Section.

Dwight C. Van Meter has been elected vice president in connection with New York Service of N. W. Ayer & Son, Inc. Service supervisor for the Electric Companies Advertising Program, he now assumes major responsibility for Ayer service to ECAP.

Patrick L. McLaughlin has been named residential electric space heating specialist for the Potomac Light and Power Co.

John V. Collis has been elected a member of the board of Louisville Gas & Electric Co.

Roy A. Keene, Jr., has been named manager of the Crystal Springs office of Mississippi Power & Light Co, succeeding **E. W. McGraw** who retired.

Joseph D. Ristroph has been promoted to system superintendent of production of the Virginia Electric & Power Co.

Wahkiakum County Public Utilities District has named **Mitchell Doumit** as manager.

Roy McKenzie, Sr., has been elected vice chairman of the Electric Power Board of Chattanooga.

Puget Sound Power & Light Co has named **Dave Knight** superintendent of system operations. **Gene Bush**

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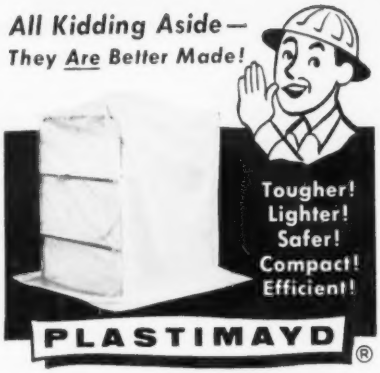

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has been named power planning engineer and **Larry Hall,** assistant to the operating manager.

Seattle City Light has named two industrial sales engineers: **Joseph P. Recchi** becomes supervisor of industrial sales section; and **Arthur F. Turner** becomes industrial development manager.

R. G. Kenyon has retired as vice president of Southern California Edison Co.

R. **Elliott Green** has been named commercial manager for the Spartanburg area of Duke Power Co.

Thomas O. Michels has become transmission engineer of Consumers Public Power District.

South Carolina Electric & Gas Co has made the following appointments: **Frank C. Davis** named general commercial manager; **C. C. Lawson,** appointed director of public relations; **H. W. Weldon** named manager of employee relations. In the Columbia division, **J. T. Stepp** has been made commercial manager; **Calvin H. Brown,** assistant commercial manager; **E. L. Pressley,** division personnel representative; and **A. J. Perrone, Jr.,** division distribution engineer. In the Charleston division, **John T. Munday** has been appointed assistant commercial manager; **L. O. Darby,** industrial utilization engineer; **C. H. Long,** personnel director; and **L. H. Perry,** district engineer.

Eastern Shore Public Service has elected **Luther T. Burbage** secretary-treasurer. **N. Weaver Wolfe** has been named assistant secretary —treasurer; and **Howard Hitch** has been appointed to the post of general auditor.

Roy A. Stroyeck has been promoted to district manager at Litchfield for Illinois Power Co.

Jack A. Palmer has been appointed director of public relations and personnel of the Kentucky Power Co.

Vernon C. Cole has been named production superintendent of The Connecticut Light & Power Co. **Wilbur B. Couch** becomes security co-ordinator, a new post.

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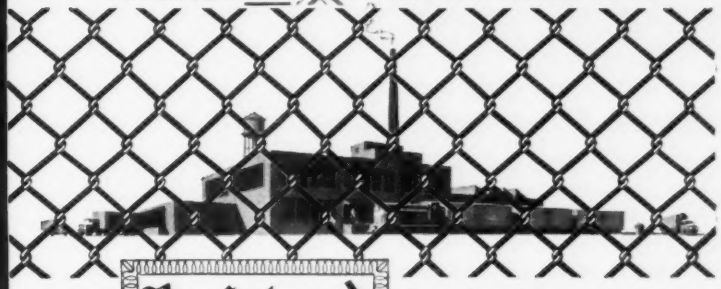

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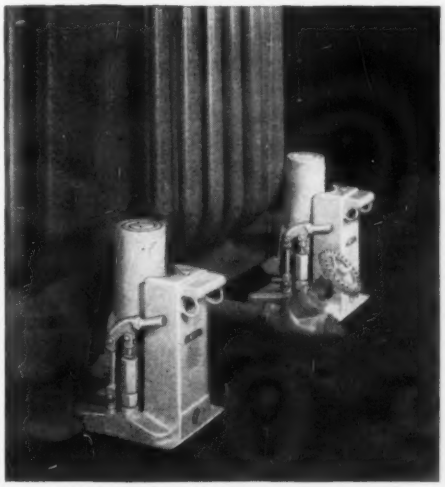

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TJ-25	25	110	14	7	Min. Ht. 2½" Width 4½"	9"x12"
TJ-50	50	230	18	10	Min. Ht. 3½" Width 5½"	11½"x14¼"

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☐ **NATIONAL ELECTRICAL CODE HANDBOOK**

Gives explanations of rules and measurements based on the 1956 National Electrical Code—what they mean—how to apply them. By **A. L. Abbott.** Rev. by **C. L. Smith,** Nat. Fire Protect. Assn. **9th Ed., 642 pp., 394 illus., $9.00.**

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Minor Materials System

(*Continued from page* 58)

a loading factor comprised of a weighted average quantity of essential minor materials to each item of major material. Use of this method is shown in the accompanying table. The loading-factor method was selected because it:

1. Ties in directly with general rules and specifications for standard construction.

2. Can be altered readily to include new types of equipment and new methods of construction.

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Readers Forum

"Time to Get Going"

To the Editor:

Economist Dean Russell's comments on TVA were excellent and easily understood (EW, Jan. 12, p 49).

Private power companies should use material like this to keep the public informed.

Many friends would be gained by these companies if the taxpayers knew and understood how the government is spending their dollars.

As the issues are going to be "hot" in Washington this year as never before, it is time to get going. Don't you think?

William McKenna
Chief Operator
Sherman Station
New England Electric System
Rowe, Mass.

When Co-ops Serve Industrials

To the Editor:

The Nov. 24th issue carried an item on the citation given Ohio Power Co by Hancock-Wood Electric Co-op Inc.

We wish to call your attention to an error in the article, with respect to the co-ops serving industrial customers before the agreement was signed. The correct interpretation of that part of the contract is:

If subsequent to the date of this agreement the co-operative agrees to furnish energy to an industrial customer at rates lower than the applicable filed tariff of the company, company will bill co-operative for this portion of the energy supplied at its applicable filed tariff.

A. A. Armbrust
District Manager
Ohio Power Company
Western Division
Findlay, Ohio

"Electrical" Vs "Electric"

To the Editor:

With reference to the letter inquiring about use of "Electric" or "Electrical" (EW, Jan. 12, p 104), We abide by the American Standard Definitions of Electrical Terms, published by the AIEE since 1941, Group 95, Section 90 (Page 251)...

Some dictionaries indicate these terms as synonymous but usage in the electrical engineering field has in general been restricted to the meaning given in the definitions above. It is recognized that there are borderline cases wherein the usage determines the selection.

We have had no difficulty in applying the terms as above.

I. M. A. Garcia
Mgr.-Electrical Design Operation
Design Engineering Operation
Construction Engineering
General Electric Co
Hanford Atomic Products Operation
Richland, Washington

"Electric" or "Electrical"

To the Editor:

Answering Mr. Thornton's letter in the January 12, 1959 Electrical World (p 104), I quote from page 13 of Information for Authors (1945 reprint) issued by American Institute of Electrical Egineers: "The words 'electric' and 'electrical' should be used in their proper senses. Electric means containing, producing, arising from, actuated by, or carrying electricity or capable of so doing. 'Electrical' means related to, pertaining to, or associated with electricity, but not having its properties or characteristics. Examples: electric power, electrical industry."

Although Websters Unabridged says "In many phrases either electric or electrical may be used, but usage tends to prefer one or the other according to the noun with which it is used," and recognizes such inconsistencies as "electric attraction" and "electrical repulson," the AIEE definitions tend to precision in technical writing and should be followed wherever they do not conflict with well-established usage.

Samuel S. Watkins
Consulting Engineer
3223 Netherland Ave.
New York 3, N. Y.

Readers Forum is your column in ELECTRICAL WORLD.

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ME58-30

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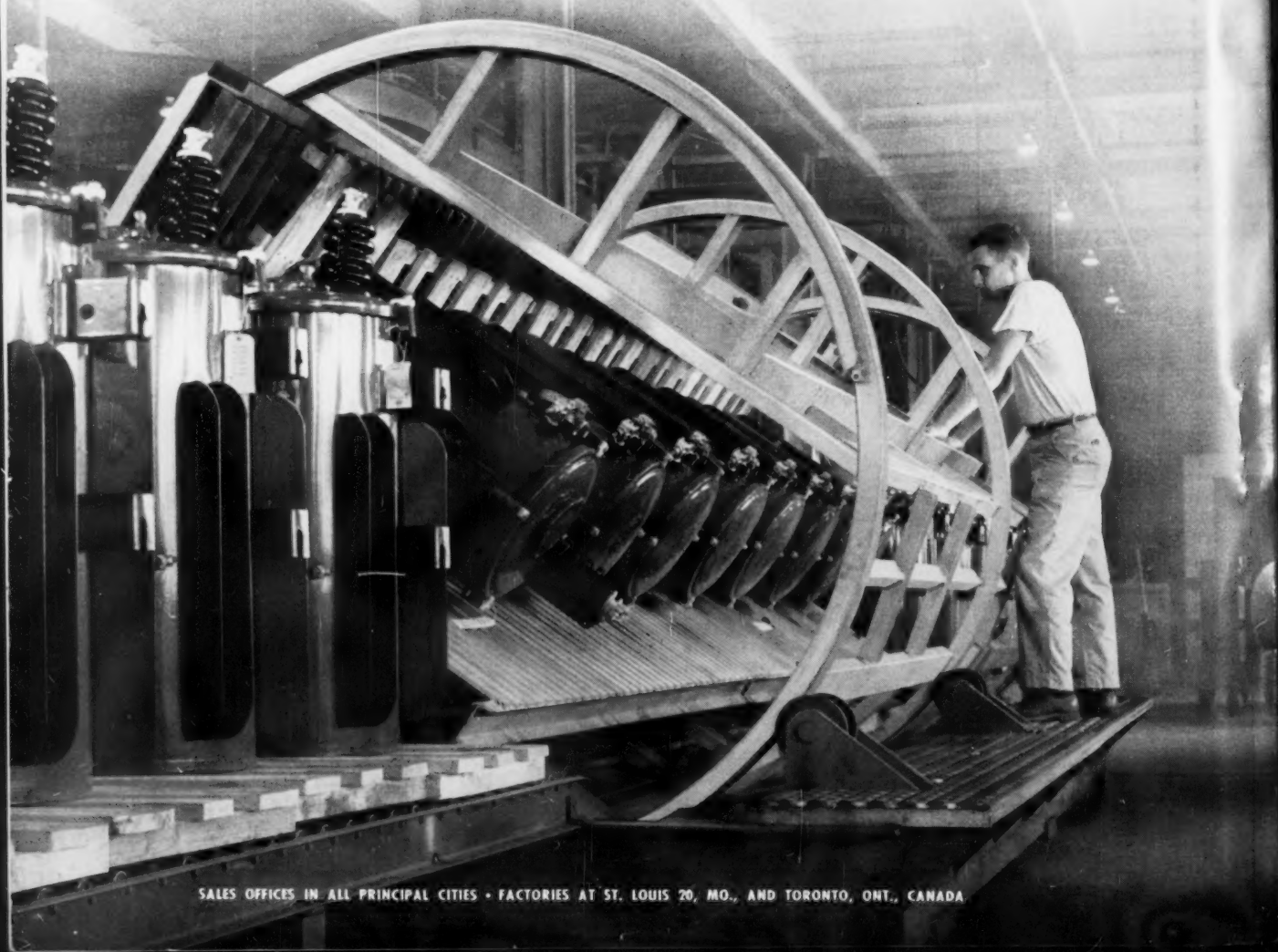

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